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A BUTTERFLY BOOK
FOR THE POCKET

OXFORD UNIVERSITY PRESS

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By the same Author

A BIRD BOOK FOR THE POCKET

A BEAST BOOK FOR THE POCKET

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A FLOWER BOOK FOR THE POCKET

"

By M. SKENE

A BUTTERFLY BOOK FOR THE POCKET

*Including all species to be found
in the British Isles with life-sized
coloured plates and life histories*

BY
EDMUND SANDARS

OXFORD UNIVERSITY PRESS
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1939

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IN PIAM MEMORIAM
PARENTUM
T.C.S. ET M.K.S.
QUORUM HIC PUEBUM
PAPILIONES COLLIGERE DOCUIT
ILLA CAPTOS
TAM PERITE DISPONEBAT
UT IN HIS PAGINIS
DEPINGI POSSENT

PREFACE

'How dare you write another book about butterflies, they are already countless?' True, but how many are there in which the plates face the text relating to them and can be looked at without twisting the book, and in which the reader is spared the weight and the dazzling glaze of clay-laden paper?

I began this book fifty years ago and still have a childish drawing of the Swallow-tail, *machaon*, made at that time.

I have tried to encourage beginners, such as I then was, by including in the body of the book only such Butterflies as are really British. I still recall my youthful annoyance with writers who seemed to expect my collection to contain a Large Copper, *dispar*. I therefore do not begin this book with a large American species of which a few reluctant captives have reached us in the holds of ships bearing bananas. The extinct are omitted altogether and those which, if seen, produce a letter to the press, have been relegated to an appendix. The collector is not expected to have them. If he gets them, it will be from abroad or by unmerited chance. For much the same reason, freaks have been dealt with very briefly and all pictures of them have been omitted.

All the coloured plates are life-size. Those of the Butterflies were drawn from specimens in my own collection or in the British Museum, where the authorities have, as ever, been infinitely patient and helpful.

I have tried to assist the reader to understand the

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structural characters of the various genera. In 1934 the Royal Entomological Society issued an authoritative list of our genera and species which is here followed. The student often asks himself why any given species is classed in a certain genus or family. Why is the Marbled White, *galathea*, not a White but a Brown? These questions cannot be answered without some knowledge which I have tried to convey, I hope without needless detail or pedantic verbiage, and there is a diagram of the wing structure of each genus in the text.¹

It is my belief that even the youngest collector does not shrink from scientific names, and if he takes the subject seriously the sooner he learns them the better. Here, therefore, whenever a species is named, it will usually be by both the English and the Latin (specific) name.

I have not tried to translate these Latin names, as I did in my *Beast Book*, because in the case of the Butterflies this would make a large part of the book into a dictionary of Greek mythology. It is beside the mark to say that the Ringlet, *hyperanthus*, is named after one of the fifty sons of Aegyptus, and still more so to tell improbable tales about Aegyptus himself, or even his fifty sons.

A few species have names which are descriptive (though sometimes wrongly so, for instance, *sinapis*) and these are explained in the Index, where will also be found a glossary of the scientific terms used, most

¹ Life-size for the larger genera, twice life-size for the smaller. For the loan of prepared specimens enabling me to draw many of these, I am grateful to Mr. H. M. Eddlesten.

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of which are between brackets so that the book can be read without them.

I must apologize for the fact that the first part of the book contains references to species which are not described until later, but, on the whole, I thought this the better course to follow.

The Time-Tables which appear under each species are, I hope, self explanatory. They are divided into monthly vertical columns. In the January column will be found the condition (egg, larva, pupa, or adult butterfly) in which the species spends the winter, with continuing dashes ----- for the rest of the time spent in that condition. Each month is spaced so as to occupy 4 weeks, so that if only 2 letters or dashes are found in a given month the table means that it is unusual to find the species in that state beyond the middle of that month. As the perfect insect's period of flight as a **Butterfly** rarely lasts 9 weeks, this word has been variously curtailed (to Buttrfly, Butrfly, Butfly, Bufly, Bfly, and But) to make it the required length. The thicker type used for this word should make it easy at a glance to see when the insect is likely to be seen on the wing.

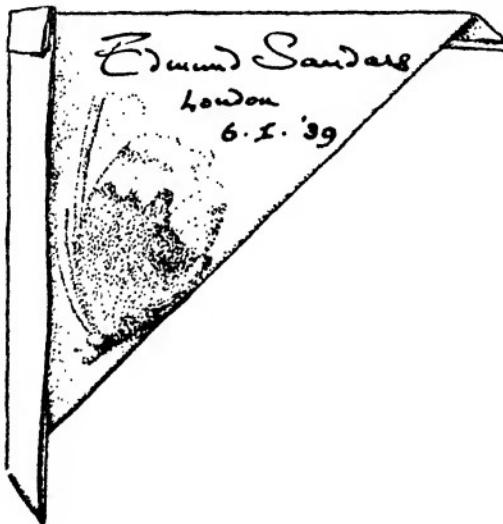
The Flower Book for the Pocket, in this series, has been followed for the English names of plants and the Latin names are omitted unless the species is one which does not appear in that book.

The paragraph on Identification is inserted only when it seems to me to be required by the likeness to some other species.

The usual instructions as to how to catch and to set Butterflies have been omitted—even the hints as to

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how to build a net or to construct a killing bottle with deadly chemicals, the sale of which is forbidden. No such book-learning will suffice and an hour's personal teaching is better than any reading. In fact, the net will be bought and the Butterflies will be killed by a pinch of the chest. The taxidermist who supplies the net, pins, relaxing jar, and stretching-boards will teach a beginner how to use them, and trial and error must do the rest. Here I will only give one tip. Any Butterfly caught can be kept and carried without injury in a square of paper, folded diagonally from corner to corner and with a narrow edge of the two open sides folded back to close the triangle when the specimen is in it. Write the date and place on the paper. The Butterfly can be so kept for any length of time before being relaxed, pinned, and set.



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NOTE

Remember that

$\textcircled{\text{M}}$ is the symbol of the planet Mars,
and means MALE.

$\textcircled{\text{F}}$ is that of the planet Venus, and
means FEMALE.

BUTTERFLIES

SUB-ORDER *RHOPALOCERA*

THE great Swedish naturalist Linnaeus named one of the large groups into which he divided the animals 'INSECTA'. This group contained all the creatures which wear their skeletons on the outside, that is, have hard coverings of a horny material called chitin, and whose body and limbs are made up of segments united by thinner flexible joints. These are now known to science as the Arthropods (or joint-legs) and include the lobsters and crabs, the wood-lice, the scorpions, the spiders, and the centipedes, as well as all the six-legged creatures to which the modern name of 'Insects' has been scientifically restricted. In common speech the word Insect is nearer to the original Linnaean meaning. Most people use the word to cover all of the above-named except the lobsters and crabs.

The class of Insects, even as limited by the modern scientist, includes a vast number of species and is divided into about a dozen Orders of which that containing the Butterflies and Moths (the Lepidoptera) alone includes many thousands. The Lepidoptera (or scale-wings) differ from other Insects in having their whole surface, and particularly the wings, covered with minute scales, set much as are the slates on a roof. These form the dust which gives them their colour and which falls from the wings when touched.

Among the vast myriads of the Insects, none have attracted more notice, either from wise men or from schoolboys, than the Butterflies. There are various

BUTTERFLIES

reasons for this. They are very beautiful and varied in colour. Here in Europe, at least, the number of species is reasonable: there are only about 60 British species. They neither sting, bite, nor stink. Their capture is difficult enough to amuse, provides exercise not too violent for young or old, and is restricted to hours suitable for the former. To set captured specimens needs neatness and dexterity. To know them apart and arrange them correctly needs care and observation, and the habit of quick recognition of species in flight gives a training valuable throughout life. No youngster who has been through the Butterfly-collecting stage will ever regret it.

Now Moths, in some respects, form a contrast to the above. They are comparatively colourless and dull to look at. Their numbers are excessive: it is only by rejecting the smaller Moths altogether that the number of British species can be got down to about 800. They have to be pursued at night, when the young should be in bed, and by unsportsmanlike methods. Moths can, as a rule, not be distinguished until after death.

Nevertheless, it is not so easy to state correctly the distinction between a Butterfly and a Moth. Intermediate forms exist. Fortunately for us in Britain, however, there is one definite distinction. All our Butterflies have their horns, or antennae, ending in a club-shaped swelling and, while the Moths have antennae of almost every conceivable shape other than the club-ended, no Moth's antenna ends in a club.

So clear is the distinction between the Butterflies and Moths to us in this country that we have not even got an English word, like the French 'papillons', which

MOTHS

includes both, and we are therefore obliged to use the scientific name 'Lepidoptera' when we want to speak of them together.

How then are we to know a Butterfly from a Moth? The answer is best set out in column form thus:

BUTTERFLIES	MOTHS
have clubbed antennae,	have antennae of other shapes,
fly by day,	fly by night,
are brilliantly coloured,	are brown or dingy,
sit with wings meeting over the back,	sit otherwise,
have no connexion between the fore and hind wings,	have some gadget for holding the wings together in flight,
have relatively small slim bodies.	have often large furry bodies.

In further explanation of the above, it should be said that, for British species, the antennae test suffices. No British Moth has a true clubbed antenna. Those few foreign species that have are unmistakably Moths in other respects, having the wing-connecting gadgets: straps across the fore wings (*retinacula*) and bristles (*frenula*) passed through them from the fore part of the hind wings, or, alternatively, a nick in the fore wing which makes a short tail (*jugum*) which grips the hind. All our Butterflies fly by day, though one or two species (e.g. the Peacock, *io*) may also fly by night. The great bulk of the Moths fly by night, but a few fly by day and some both by day and night. One or two of the Skipper Butterflies sit moth-wise and a few of the Moths in the position which is characteristic of the Butterflies. There are Moths which lack the wing-connecting mechanism, but none of these have clubbed antennae. There are Moths with slim bodies, but no Butterfly is really fat and furry. Several Butterflies are

BUTTERFLIES

dull and uninteresting in their colouring, and a few Moths brilliant and beautiful.

Still, the differences which the parents recognize when bidding a small boy to collect Butterflies but not Moths are so real as to have resulted in a main division of the Lepidoptera into Rhopalocera (club-horns = Butterflies) and Heterocera (other-horns = Moths) and, although some recent authorities have wished to discard this division, because it raises the Butterflies (which in their view should not be more than a family) to the status of a sub-order, the sub-order of club-horns survives in scientific language, as it does in this book, and in fact.

Most Insects change their shape and appearance in the course of their lives more completely and more dramatically than any other creatures. Among the great group of the vertebrates only the Frogs and their near relatives of the order of Amphibia do anything of the same kind. They have to pass from the water to the dry land and change much in so doing. But they and all other vertebrates, including ourselves, wearing our skeletons inside us as we do, can grow throughout our lives, adding flesh to our flesh and bone to our bones. When we turn to the Butterfly, or any other arthropod, we find a totally different state of things. They wear their skeletons on the outside. The Butterfly caterpillar or the Lobster can only grow by first climbing out of his skeleton and then, after a dangerous, because unprotected, interval, hardening another, larger, one. This is true of the whole group of 'joint-legs', but the habit of making a change in shape and appearance and in internal anatomy and constitution,

METAMORPHOSIS

at the time of some of these moults, is the monopoly of certain orders of Insects. Few show this habit more perfectly than the Butterflies.¹ Whereas the young Spider or the young Earwig, newly hatched from the egg, looks much like its parents (though it will have to moult several times before attaining their size), the young Butterfly is not a Butterfly at all. It is a wingless, gnawing, and crawling worm: a Larva or Caterpillar. Again, after several moults, this Larva changes into something completely different, called a Pupa or Chrysalis, which is no more a Butterfly than was the Larva. It is an inert, sightless mass, enclosed as it were in a glass case moulded upon a Butterfly, in which the whole body is shortened and fattened and the wings reduced to a fraction of their true size. It is not until the next moult after this, when the case splits and is shed, that a Butterfly comes out, as did Athene, full armed, from the head of Zeus.

Every Butterfly, then, goes through the successive stages of Egg, Larva, Pupa, and finally Imago, or adult Butterfly. Of these the larval stage alone endures for more than the period between one moult and the next, and the Larva alone grows.

Before going into a description of the life of the Insect through these various stages some thought must be given to the life of the various species as a whole. One of the problems which faces every creature living in this part of the globe is how to get through the winter. The Butterflies of the tropics have no such difficulties. They live their short lives, hatching, developing, breeding, and dying, regardless of the

¹ This is called 'complete metamorphosis'.

BUTTERFLIES

almanac, thus going through 4 or even 5 generations a year, without hindrance from the weather.

In some countries the question of how to face the summer, when vegetation is dried up, is the serious one. This is a trouble from which we do not suffer, but there is some evidence that some of the Butterflies that live here, perhaps particularly migrant species, still keep the habit (doubtless learned in hotter climates) of what is known as 'aestivating', that is of retiring to sleep in midsummer. Such of our species as do this also prolong their slumbers till the spring.

The winter problem is, however, for all species a very real one. The Larvae need vegetation on which to feed and the Butterflies need flowers from which to sip nectar, and our winter gives neither. How then do our species get through the winter?

Oddly enough there is no single answer to this question. Each species has worked out for itself the answer in its own way. Some hibernate as eggs, some as Larvae, some as Pupae, and some as adult Butterflies.

Perhaps the most remarkable fact is that these habits are, within each species, as unvarying and fixed as any physical character. There is only one species, the Speckled Wood, *aegeria*, which sometimes winters as a Larva and sometimes as a Pupa. All our other Butterflies pass the winter in some one of the four states, and in one only.

In one or other of their stages, then, they remain more or less asleep or quiescent for all the winter months. This leaves a period of about 6 months of activity, the actual length varying with the weather of the particular year or place. During this warm spell

WINTERING

some Butterflies breed and die, leaving their offspring to survive till the following year. Such produce one generation a year, the life of the individual lasting about 12 months.

Others are shorter lived, producing 2 generations a year; the individuals which wintered, breed and die in the spring, leaving their eggs to develop, breed, and die before winter, these in turn leaving a generation to survive the winter. In this case the duration of life of individuals of the 2 generations differs greatly, as the 6 months of hibernation fall to one only: one lives about 3 months and the other about 9.

Again, others are even shorter lived and go through three generations in the warm weather, 2 of which live roughly for 2 months each and the third for about 8.

In all these cases life is measured from the hatching of the egg to the death of the Butterfly. In many species, and under favourable weather conditions, there is a tendency to produce in the same batch of eggs some (called 'forwards') which hasten to breed again, and others which take life more slowly (called 'backwards'). Thus what is known as a partial generation occurs, of which the members, like Siegfried, may select spouses from among their aunts who have had a long sleep. The word 'brood' is too often used in this connexion, a species being said to be single, double, or treble 'brooded'. This word is confusing. A bird may be double brooded, laying two clutches of eggs in the year, but not a Butterfly. The Butterfly breeds once and then dies.

TABLE OF LIFE HISTORIES

The following table gives the facts about each of the 58 species of Butterflies which breed in the British Isles.

Species	Generations	Winters as:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
SATYRIDAE														
Speckled Wood, <i>aegeria</i>	2-3	L. or P.												
Wall, <i>megera</i>	2-3	L.												
Sm. Mtn. Ringlet, <i>epiphron</i>	1	L.												
Scotch Argus, <i>aethiops</i>	1	L.												
Marbled White, <i>galathea</i>	1	L.												
Grayling, <i>semele</i> .	1	L.												
Meadow Brown, <i>jurtina</i>	1-2	L.												
Hedge Brown, <i>tiltonus</i>	1	L.												
Small Heath, <i>pampelous</i>	1-2	L.												
Large Heath, <i>tullia</i>	1	L.												
Ringlet, <i>hyperanthis</i>	1	L.												
NYMPHALIDAE														
Pearl-Bord. Frit., <i>euphydryas</i>	1-2	L.												
Small P.-B. Frit., <i>selenis</i>	1-2	L.												
Dark Green Frit., <i>aglaja</i>	1	L.												
High Brown Frit., <i>cycladis</i>	1	E.												
Silver-washed Frit., <i>paphia</i>	1	L.												
Marsh Frit., <i>aurinia</i>	1	L.												
Gianville Frit., <i>clixia</i>	1	L.												
Heath Frit., <i>athalia</i>	1	L.												
Red Admiral, <i>atalanta</i> .	2-3	B.												
Painted Lady, <i>cardui</i>	2-3	B.												
Small Tortoiseshell, <i>uticae</i>	1-2	B.												
Large Tortoiseshell, <i>polychloros</i>	1	B.												
Peacock, <i>io</i>	1	B.												
Comma, <i>c-album</i>	2	B.												
Purple Emperor, <i>iris</i>	1	L.												
White Admiral, <i>canalla</i>	1	L.												
RIODINIDAE														
Duke of Burgundy, <i>lucina</i>	1	P.												
LYCAENIDAE														
Small Blue, <i>minimus</i>	1-2	L.												
Silver-Studded Blue, <i>argus</i>	1	E.												
Brown Argus, <i>agesilaus</i>	1-2	L.												
Common Blue, <i>icarus</i>	1-2	L.												
Chalkhill Blue, <i>cordua</i>	1	E.												
Adonis Blue, <i>bella</i>	2	L.												

LIFE HISTORIES (cont.)

Species	Generations	Winters as:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
LYCAENIDAE (cont.)														
Large Blue, <i>arlon</i>	1	L.												
Holly Blue, <i>argiolus</i>	1-3	P.												
Small Copper, <i>pheleas</i>	3-4	L.												
Green Hairstreak, <i>rubi</i>	1	P.												
Brown Hairstreak, <i>betulae</i>	1	E.												
Purple Hairstreak, <i>quercus</i>	1	E.												
White Letter Hairstreak, <i>w-album</i>	1	E.												
Black Hairstreak, <i>prun</i>	1	E.												
PIERIDAE														
Wood White, <i>sinapis</i>	1-2	P.												
Large White, <i>brassicae</i>	2-3	P.												
Small White, <i>rapae</i>	2-3	P.												
Green-veined White, <i>napi</i>	1-2	P.												
Orange Tip, <i>cardamines</i>	1	P.												
Clouded Yellow, <i>croceus</i>														
Brimstone, <i>rhanini</i>	1	B.												
PAPILIONIDAE														
Swallow-tail, <i>machaon</i>	1-2	P.												
HESPERIIDAE														
Dingy Skipper, <i>tages</i>	1-2	L.												
Grizzled Skipper, <i>malvae</i>	1-2	P.												
Chequered Skipper, <i>palaemon</i>	1	L.												
Small Skipper, <i>sylvestris</i>	1	L.												
Essex Skipper, <i>lineola</i>	1	E.												
Lulworth Skipper, <i>acteon</i>	1	L.												
Silver-spotted Skipper, <i>comma</i>	1	E.												
Large Skipper, <i>venata</i>	1	L.												

In the first column is the name of the species. In the third the stage in which it passes the winter months (Egg, Larva, Pupa, and Butterfly being indicated by their initials: E. L. P. and B.). In the ensuing 12 monthly columns, separated by finer lines, are the dates between which it may usually be seen in flight. The horizontal lines indicating this are thinned out into dots when appearance in flight is dependent upon unusual weather conditions. Fuller details showing the various generations produced are contained in the time-tables given under each species.

BUTTERFLIES

The preceding table shows that 9 species winter as eggs; 10 species winter as Pupae; and 6 hibernate as adult Butterflies. Omitting the Speckled Wood, *aegeria*, before mentioned, all our other species winter as Larvae. These are 30 in number.

Those which winter as eggs seem almost always so to do after the full development of the Larva has taken place, and just before the effort to hatch is made. They are very near to the next group of larval-winterers.

More than half our species winter as Larvae and they do so in very different stages of the larval growth. Some, particularly the large Fritillaries (Dark Green, *aglaia*, and Silver-washed, *paphia*) take no food after emergence from the egg and thus hibernate in their first skins as small Larvae. Others, for instance the Small Blue, *minimus*, the Dingy Skipper, *tages*, and the Chequered Skipper, *palaemon*, winter as full-grown Larvae after their last moult, and others again at any stage they may have reached when the drying up of the leaves on which they feed gives them no choice but to sleep or starve. The special food-plant eaten by the Larva (for every species has a special diet, usually very restricted—sometimes to one species of plant only) will usually account for the different life-cycles adopted. Thus those species which live on deciduous trees have but one generation a year and their Larvae, if they winter as such, have an unbroken winter sleep. Those which are grass feeders have usually but one generation a year, but their Larvae are often inclined to be wakeful and to nibble during the winter. The whole question of the food of the different Larvae will be dealt with in greater detail later.

BIRTH-RATE

At first sight it would seem as if the pupal stage were the ideal condition for wintering. The creature has become rigid, covered itself with a hard envelope, and has nothing to do. Its entire internal anatomy is, as it were, in the melting-pot, all the larval organs being dissolved and the regrouping of the cells into those of the Butterfly not yet achieved. Yet of our species (and indeed of those of the hibernating lands generally) only a few choose this stage for the winter. The fact is that we know all too little of the contents of that melting-pot, or how necessary to the reconstruction certain temperatures may be. We do, however, know that 10 of our species winter as Pupae, suspending that stage over the winter.

The last group, those which spend the winter as adult Butterflies, is also a small one and, of the 6 species in it, 3 are either proved to be, or suspected of being, migrants.

Butterflies have a very heavy birth-rate, some species laying more than 500 eggs. The number varies with the size of the eggs, but from 200 to 300 seems to be the usual number. This, as throughout nature, is, in the long run, exactly balanced by the death-rate. Where there are 2 generations a year, 200 might mean 20,000 eggs from one couple. Throughout their various stages they provide food for countless enemies. Birds, Mice, Lizards, Frogs, and Spiders eat them as do also many Insects. Far the most destructive of their enemies are the other Insects usually known as Ichneumons. These really belong to many different families, relatives of the Wasps (*Hymenoptera*) or Flies (*Diptera*), only a small proportion being *Ichneu-*

BUTTERFLIES

monidae. It is impossible to enumerate them here, or indeed at all—they are too many and too little is known of them. One example deserves mention as it is one of the chief enemies of the Large White, *brassicae*, which is Man's only serious enemy among our Butterflies. This, a tiny 4-winged insect, is *Apanteles glomeratus* (which may be translated 'massed imperfection'), and it lays its eggs in the egg of the Butterfly. Its eggs change to Larvae with the Butterfly and live floating in the Larva's blood, not killing it until it is fully grown, when they escape from a hole in the Larva's belly and form a mass of cocoons of their own upon the skin of the dead Larva, from which many 'imperfections' soon emerge to go on with the good work. If, in your search for Caterpillars, in the hope of saving your cabbages, you come across some that are brown and sickly looking, or, above all, across skins covered with a mass of tiny cocoons, spare these carefully—they are mere nurseries of the saviours of your crop. Many Ichneumons place their eggs in the Larvae and a few in the Pupae, and their adult forms vary from creatures barely visible without a glass (and of which many—in one recorded case as many as 1,200—come out of one Caterpillar) to quite large insects of which one Larva alone can be housed in the victim.

This subject brings up another question, the relation between the Butterflies and Man. No Butterfly (in the adult stage) does Man any harm, either by stinging, biting, conveying disease, or diminishing his food supply. No Butterfly (in any stage) is beneficial to Man in the sense of bringing him wealth, as does the Silkworm Moth or the Honey Bee. They doubtless

RELATION TO MAN

do a certain amount of plant fertilization, supplementing the work of the bees and other insects, though probably not much. The adult insects may therefore be classed as innocuous to our pockets and persons, and, as almost all of them are beautiful, the aesthetic pleasure we get from them stands wholly to the credit side of their account. When we turn to their Larvae a different situation arises. Each species has to be separately considered and judgment given according to the food-plant. This judgment, like most others, varies with the composition of the court. Is the Painted Lady, *cardui*, 'good' or 'bad'—to be encouraged or exterminated? It lives on thistles and an English jury readily brings in a verdict of 'Not guilty'. A jury from Provence, whose livelihood is largely derived from growing artichokes, shouts 'Guilty' without leaving the box. Generally speaking, we may safely say that the great majority of our species do little if any harm or good to Man. Two species alone, the Large White, *brassicae*, and the Small White, *rapae*, are clearly and seriously harmful, for their Larvae feed almost wholly, and very voraciously, upon the cultivated vegetables on which Man relies for food for himself and his beasts.

To look at another aspect of the picture. Assuming that we have decided that the pleasure we get from Butterflies compensates for any injury they may do, and that the destruction of any species is an irrevocable mistake, if not a crime, is it foolish to collect Butterflies? Perhaps 50 years ago the answer should have been yes, but one thing has completely changed this.

EGGS

It has been found that the most perfect specimens are obtained by breeding and a Butterfly farming business (dependent upon collectors) has been established which does more to replenish our stock of rare species than the net does to deplete it. The collector is, therefore, helping to preserve and save our heritage of Butterflies.

We may now consider the development of a Butterfly in greater detail.

The mother lays her Eggs, usually one by one, upon a leaf or stem of the food-plant which is to feed the unborn Caterpillar. To this rule there are few exceptions. Two species alone (the Marbled White, *galathea*, and the Ringlet, *hyperanthus*) scatter their eggs broadcast over an area where the grasses which are the food-plants are growing. Their eggs lack the sticky ends which enable those of all our other species to stay where they are placed. There are also a few species which lay their eggs not singly but in masses, all, or a large part of, the clutch, in a body together. Such are 3 of the Fritillaries (the Marsh, *aurinia*, the Glanville, *cinxia*, and the Heath, *athalia*) the 2 Tortoise-shells (*urticae* and *polychloros*) the Peacock, *io*, and the Large White, *brassicae*. There are 4 other species which lay their eggs in small numbers together: the Duke of Burgundy, *lucina*, and 3 Skippers, the Small, *sylvestris*, Essex, *lineola*, and Lulworth, *acteon*.

The eggs themselves are, under the microscope, objects of great diversity and interest. A glance at pages 71, 117, 188, 246, and 279 will give some idea of their shapes, and one cannot here do much more. It is at once apparent that there are certain family shapes.

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The 'Browns' lay eggs rather like acorns or melons, the Nymphalides lay eggs like them, but usually with wider flanges or keels projecting from them. The 'Blues', and their relatives the 'Copper' and 'Hair-streaks', lay eggs like minute millstones or flat round cheeses, diapered with delicate lacework. The eggs of the 'Whites' are like hock or champagne bottles in wicker cases, and those of the Skippers vary so much as to have no family character in common. In colour, Butterflies' eggs vary as much as in shape; though mostly browny yellow, they may be green, red, or blue. There are also changes of colour during incubation, due to the formation of the Larva inside the egg. The shell is usually of a transparent or white material and there is often a depression at the top, where there are also some minute holes (called *micropyles*) through which the egg is fertilized and through which air is admitted for the embryo Larva. Speaking very roughly, for in every case the time varies with the weather, a Butterfly's egg takes about a week to hatch. To this must, in the case of wintering eggs, be added the 6 months of quiescence.

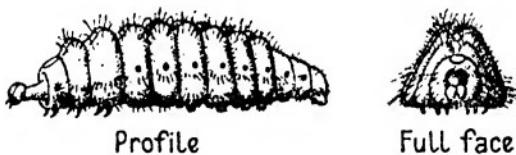
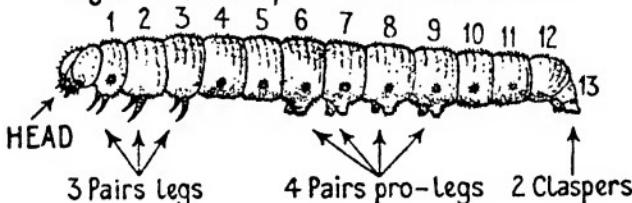
Larva. When the Larva is formed and ready to come out, it eats a round lid in the shell which it then pushes open or (more often) it merely eats enough of the shell to make a round hole through which it can crawl out. It emerges a very minute but perfectly formed Larva or Caterpillar.

A Caterpillar is a long, worm-like creature made up of a head and behind it 13 ring-shaped segments. The head is not counted as a segment because in fact it is made up of 4 or more different segments, so that the

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1st segment is the one behind the head. The following sketch represents the two types of Butterfly Larvae: the cylinder or tube type, and the wood-louse type. Except in shape, they are much alike. In the wood-louse type the head is small and attached by a long neck which can be drawn back inside the 1st segment.

Segments, with spiracles on No.1 and 4 to 11

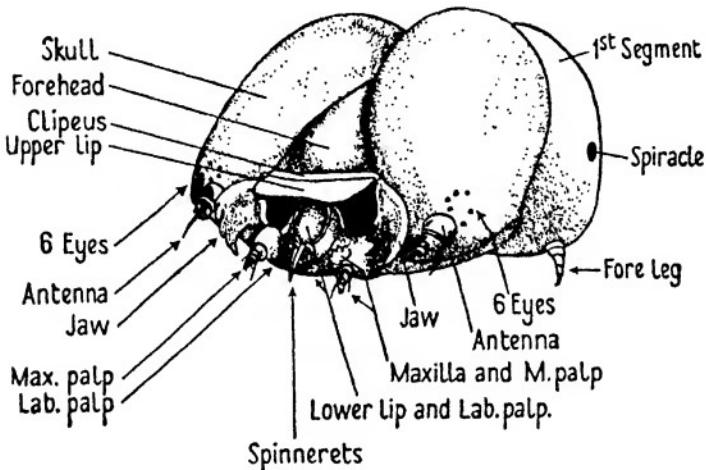


The head consists of 2 rounded bumps of skull which look like the eyes of the adult Butterfly, but these bumps (*epicrania*) are not eyes. The eyes, 12 in number, are minute dots, visible only with a strong glass, 6 in a semicircle dotted round each antenna near the lower edge of the bumps. The bumps are separated by an indented line (*suture*) above, and below by a triangular plate or forehead (*frons*). The horizontal lower edge of the forehead forms a ridge (*clipeus*) to which is attached the movable upper lip

STRUCTURE

(*labrum*). At each side of the upper lip, and attached to the same ridge, are the main, upper jaws (*mandibles*), which in insects work sideways, not up and down, meeting in the centre of the mouth.

When looked at from the under side the 2 rounded bumps of the skull are found to be held together by a



large chin-plate (*mentum*). The extreme tip of this plate joins on to the lower lip (*labium*), which bends back and into the mouth, under the upper lip, in the form of an oval disk which blocks the entrance when the lower lip is raised. The lower, forward end of this disk bears 2 tiny tubes, the Spinnerets, whence comes the liquid which dries into silk. On each side of the spinnerets, on the lower lip, are a pair of tiny limbs (*labial palpi*), and on each side of the chin-plate, just behind the lower lip, 2 more, lower, jaws (the *maxillae*), from the outer sides of which grow a slightly larger

LARVA

pair of limbs (the *maxillary palpi*). In short, the Larva's mouth is a superb chewing machine, with 2 hard lips, 4 jaws, 6 sensory organs, and 12 eyes, all focussed upon its food.

Behind the head, the first 3 segments are each equipped with a pair of 5-jointed legs ending in a claw. They are often called the 'true legs', not because the Larva does use them for walking (they do little more than steady the front end at any time) but because they are the 6 legs which survive in the adult Butterfly. Segments 4 and 5 are without legs. Segments 6 to 9, inclusive, have each a pair of soft protuberances which end in a ring of tiny hooks surrounding a flat disk which contracts to grip, and expands to release, the surface upon which the Caterpillar crawls. These are called the 'pro-legs', 'abdominal-legs', or sometimes the 'false-legs' because they are not articulated or jointed, and because they do not survive in the adult insect.

At the extreme end of the Larva is a further pair of such legs, known as the 'claspers'. In all, therefore, the Butterfly Larva has 16 legs, 10 of which walk and are called pro-legs, while 6 do not and are called true legs. There are visible breathing holes (*spiracles*) on each side of the 1st segment, and also of all those from the 4th to the 11th inclusive, total 18 spiracles.

There are always numerous hairs (*setae*) projecting from the surface of the Larva's skin, though often these are so small that the Larva is called smooth. As well as hairs there are sometimes large projecting horns or points, known as tubercles, bearing sharp and often forked spines; honey-glands; and small areas

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of skin from which mushroom-like growths can be thrust out at will. The latter are called *extensile organs*.

Internally the bulk of the body consists of the digestive tube from mouth to vent, with special organs for making the liquid which, when exposed to the air and dried, becomes silk. Along the under surface, close to the skin, runs a double line of nerves with enlargements (*ganglia*) in the head, and similar, but smaller, ganglions in each of the segments of the body down to the 10th.

Those in the head control the eyes, antennae, and all the mouth parts, and they have some general power of directing movements of the rest of the body. They are known as the brain. All the other ganglions are, however, subsidiary brains, each controlling the muscles in its own segment.

The muscles are very numerous, some 2,000, and are attached at their ends to the inside of the skeleton-skin at 2 points which can be moved closer together by a contraction of the muscle.

The next organ to be considered is the 'heart'. In an insect the system known to us in our own bodies (whereby the blood circulates in defined blood-vessels leading to every part of the body) is reversed. In the insect the organs, muscles, and nerves are, as it were, immersed in a common bath of blood. There is only one blood-vessel, the heart or aorta. This consists of a series of chambers all in a row, with valves admitting the surrounding blood from the sides and hinder ends and, by a series of contractions, driving it along in a continuous stream towards the head of the insect, where it flows over the brain and head muscles and

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organs, returning freely, and as best it can, towards the tail end, where it is again taken up into the heart. This heart lies along the insect's back. The india-rubber bulb and tube taken from a throat-spray, if held lengthwise and repeatedly squeezed under the surface of the water in a narrow trough, would give an idea of an insect's circulation.

The method of breathing of an insect is also by a system the reverse of ours. The air of an insect's body is pumped in at the air-holes (*spiracles*) above mentioned, each of which has a pump capable of inhaling and expelling the air. The air enters a complicated system of tubes (*tracheae*) each of which is kept open by a hard spiral of chitin and branches into countless smaller vessels which stretch through the blood-bath all over the insect's body. There is no circulation of air: the fresh air is pumped into the vessels and when the oxygen is replaced by carbon dioxide it is pumped out again. The mammal, in its lungs, drives blood in vessels through air which fills the lung cavity. The insect drives air in vessels through the blood which fills its whole body. The difference is similar to that between the two kinds of steam boilers, those in which the flames are in flues or tubes passing through the water, and those in which the water is in tubes passing through the flames of the fire. The sex organs exist in the Larva, but without outlets or function.

The silk glands and spinnerets have already been spoken of. There are, in fact, two sets of glands making silk, the large glands lying all along the body, which make the silk-liquid, and a pair of minute glands, one on each side of the spinnerets, which

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secrete a varnish, through which the silk stream passes, which is believed to hasten its drying. None of our Butterfly Larvae use as much silk as do some Moths (e.g. the Silk-worm), but they all use it to some extent.

There is one single vent, discharging waste materials, and under the skin of the 1st segment some gill-like sacs are visible, which are the beginnings of the future wings of the Butterfly.

When the Larva is born its first act is usually to eat up the eggshell from which it came. Some species do not do this and others do it more or less, the lower part of the shell, where it adheres to the plant, being most often left. Where this first ration is eaten, it is found to be essential, the Larva will not eat anything until it has eaten its eggshell and, without it, will die.

The great majority of our Butterfly Larvae are solitary throughout their lives and none which come from singly laid eggs ever become social. Of those which come from mass-laid eggs, one at least (the Large White, *brassicae*), though it starts a gregarious life, becomes solitary later on. The same is true of the Small Tortoiseshell, *urticae*, while the Large Tortoiseshell, *polychloros*, and the 3 gregarious Fritillaries (Marsh, *aurinia*, Glanville, *cinxia*, and Heath, *athalia*) remain gregarious until the Larvae are about to pupate.

This gregariousness, or sociability among Larvae, is not a family trait. Thus the Green-veined White, *napi*, and all the other Fritillaries (of the genus *Argynnis*) live lonely lives. Indeed, in the same genus

LARVA

(*Pieris*) our three species show three different habits in this respect, for while the Large White, *brassicae*, is highly gregarious and the Green-veined, *napi*, solitary, the Small White, *rapae*, lays several eggs together and, for the first moults at least, its Larvae are rarely found alone.

Some of the gregarious Larvae have an accomplishment unknown to their lonely brethren: they throw up their heads all at once, with a jerk. The fact of numbers and perfect unison makes this movement startling even to us, and is supposed to scare away some of their enemies. This alarming jerk and the simultaneous stopping and resumption of feeding by other species (see p. 255) have, in the precision of their unofficered drill, something in common with the unordered evolutions in flight of such wading birds as the Knot.

Solitary or gregarious, the Larva's main duty is to feed and grow. It has to grow from the size of the Egg to that of the Pupa. This feat is the reward of undistracted chewing.

Almost all our Butterfly Larvae feed wholly upon plants and, as a rule, each species keeps to a certain plant or to a group of closely connected plants. These are known as the food-plants of the species. It must always be remembered that in connexion with Butterflies we mean by food-plants the food of the Larvae, and not the plants from the flowers of which the Butterflies suck nectar.

Here a few general remarks only will be made. Under the separate species, in the descriptions of the Larvae, their food-plants are set out, and at page

FOOD

69 will be found a table of the various plants, arranged in their botanical order, with the various Larvae which feed upon them.

The following are a few general observations upon this subject.

The botanical family of *Cruciferae* comprises many wild herbs (cresses, mustards, &c.) and includes the wild sea-kale, which is the stock from which Man has developed the greater number of his domesticated vegetables. The kales, green, red, smooth, and curly, the cabbage, the cauliflower, the brussels sprout, the turnip, the swede, and the mangel-wurzel, are all derived from this single meagre wild plant of our sea-shores. Thus, by planting these crops all over the country-side for his own use and that of his beasts, Man has vastly multiplied the numbers of the species which feed upon them. These species all belong to the *Pieridae* or 'Whites' and two of them (the Large and Small Whites, *brassicae* and *rapae*) have profited by this and become our commonest Butterflies. Their other near relatives still rely mainly upon wild *Cruciferae*. The *Cruciferae* are eaten only by the 'Whites' and 'Yellows' (*Pieridae*) and, with a few exceptions, given below in the note¹ all the 'Whites' and 'Yellows' eat plants of this family only.

The *Leguminosae* (peas and vetches: the plants bearing pods) are eaten only by the Wood White, *sinapis*, the Clouded Yellow, *croceus*, the 'Blues', and by one Hairstreak (the Green, *rubi*), and one Skipper

¹ The exceptions are: the Wood White, *sinapis*, and the Clouded Yellow, *croceus*, eat only plants of the Pea family (*Leguminosae*); and the Brimstone, *rhamni*, eats only the buckthorns.

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(the Dingy, *tages*). A number of these, however,¹ eat other plants as well as *Leguminosae*.

Grasses (*Gramineae*) are eaten only by the 'Browns' (*Satyridae*) and 'Skippers' (*Hesperiidae*), and all the 'Browns' and 'Skippers' eat nothing but grasses, except the Dingy Skipper, *tages*, which eats only bird's-foot trefoil, and the Grizzled Skipper, *malvae*, which eats only certain plants of the rose family.

None of our Butterfly Larvae eat any conifer. The Holly Blue, *argiolus*, alone, eats any evergreen plant. Various deciduous trees, shrubs, and creepers, from the oak to the honeysuckle, form the food of the 'Hair-streaks' and of a small group of *Nymphalidae* (the Large Tortoiseshell, *polychloros*, the Comma, *c-album*, the Purple Emperor, *iris*, and the White Admiral, *camilla*). Of these the Green Hairstreak, *rubi*, and the Comma, *c-album*, alone have other food.

The above generalizations leave unmentioned only a small number of our species, which range over a large number of plant families, mostly of small herbs. It is enough here to add that the violets feed the genus *Argynnis*; the thistles, the Painted Lady, *cardui*; the primroses, the Duke of Burgundy Fritillary, *lucina*; the plantains, the genus *Melitea*; the sorels, the Small Copper, *phleas*; and the nettles, some other *Nymphalidae* (the Red Admiral, *atalanta*, Small Tortoiseshell, *urticae*, Peacock, *io*, and Comma, *c-album*).

To the general rule that Butterfly Larvae are

¹ Thus the Brown Argus, *agestis*, also eats rock-rose and stork's bill; the Silver-studded Blue, *argus*, also eats heathers; the Holly Blue, *argiolus*, also eats holly, ivy, and numerous deciduous shrubs or trees; and the Green Hairstreak, *rubi*, also eats cow-berry, whortle-berry, and several deciduous shrubs. One 'Blue' alone (the Large, *arion*) does not eat *Leguminosae* at all, but wild thyme and the larvae of ants.

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vegetarians there are a few exceptions. Certain Larvae, if they meet, are cannibals, and one (the Large Blue, *arion*) is carnivorous during most of its life, eating only ant larvae.

Some Larvae feed only by day, some only by night, and some, for a time at least, incessantly by day and night.

The various larval habits are characteristic of the different species, and it is worth noting that, where the same species appears on both sides of the Atlantic, it has almost always the same habits in America as here.

It is not convenient (or, until more has been said of classification, useful) to describe here the different family habits of Larvae. It is enough to tell of some of the things in which they differ. Some are slow and lethargic, inclined to get concealment from immobility and resemblance to their background; others are quick movers, hastening into cover when alarmed, or dropping instantly to the ground; others again protrude or wave an alarming, or disgusting, scent organ, or resort to the frightening jerk above mentioned.

Silk is spun for various purposes: to make a carpet on which to walk more safely than on the surface of the leaf or stem of the plant; to make a tent or covering; and to provide attachments for the Pupa. The 'tent' may take the form of an overhead carpet of silk threads, or of a binding together by silk threads of leaves or blades of grass, and it may serve for use as a shelter between meals, as a protection during the dangerous adventure of moulting, or as a winter home (*hibernaculum*) during hibernation. The use of silk for

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the Pupa will be spoken of later. It has been surmised that the carpet spun by the small Fritillaries (*Melitea*) serves them as the exact opposite of a tent of concealment by giving them a conspicuously contrasting background for their colourful gymnastics. Similar scaring tactics are adopted by most of the spiny Caterpillars of the Nymphalids—a gesture which means: ‘Surely you remember how we hurt your throat.’

Moultting (*ecdysis*) is necessary not only for the purpose of letting the Larva grow. Indeed, the shell of most Caterpillars is so elastic that the actual number of moults would scarcely be needed for this end alone. It is also a way of ridding the insect of unwanted materials of which chitin is made up, and in the moults all the harder inner parts—such as the spiral coils which line the main air vessels and keep them open when empty—are shed with the skin.

Our Butterfly Larvae usually moult four times, but, whatever the number of moults, it is constant in each species. Speaking generally, the process is as follows: the Larva stops eating and, under the existing skin, exudes a liquid which, when it has been exposed to the air and become dry, forms a new chitinous skeleton-skin. While still liquid it moistens the old skin so as to ease the effort of sloughing it. After some hours the old skin cracks, usually behind the neck, and the Larva crawls out, and then waits immobile for some hours for the new skin to harden before it returns to the serious business of its life: eating.

The coloured sketches of Caterpillars given in this

DEVELOPMENT

book and the brief notes describing them in the text relate only to the last state of the Larva, that which precedes pupation. This is the stage (*stadium*) of the fully grown Larva. It is not possible here to give a full description of all the various stages through which each species passes, because almost every Larva differs in appearance at each stage of its growth. It is usually found that, in the earlier stages, the hairs or bristles are larger, in proportion to the Larva, and more prominent than in the later stages. It is also not uncommon to find that this equipment (the *armature*) consists, in the smaller and earlier stages, of bristles (*setae*) which are forked at the ends and hollow, exuding a tiny drop of liquid which is held suspended between the two prongs of the bristle. These drops of liquid are attractive to ants and are sucked up by them, and it is to this that many of these young Larvae owe their lives. Not only do the ants not attack them, but the presence and ferocity of the ants affords them protection from many enemies.

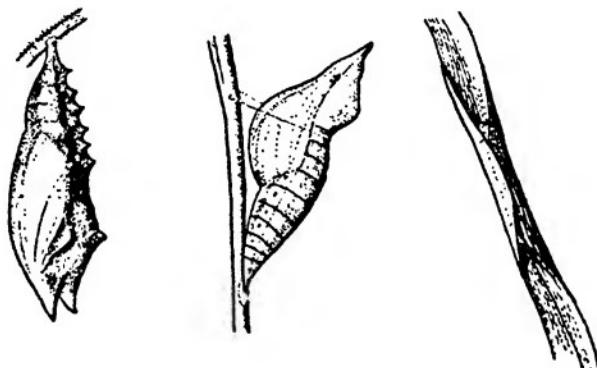
Such species (e.g. the Orange Tip, *cardamines*) often lose both the long bristles and the power of producing sweet liquids after their second moult, when the bristles are replaced by much softer and shorter hair and their skins become downy or smooth.

Although this process with its results is similar to that which will be described in connexion with the fully grown Larvae of several of the Blues (*Lycaenidae*), it differs in the fact that it appears only in the early stages, and also in the organs used to produce the coveted 'honey' and to extend it to the ants.

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The duration of life in Larvae varies greatly, but, speaking very roughly, it may be said that those which feed without being interrupted by the winter take about a month from Egg to Pupa.

The end of the Larval stage is called 'pupation' or the act of becoming a Pupa, or Chrysalis. The Larva again ceases to feed, as before the earlier moults, and usually deserts the food-plant and wanders off in



search of a suitable spot in which to undergo its major change.

The nature of such spots varies according to the habit of the species. Pupae are found in three distinct conditions, known as *suspensi*, *succincti*, and *involuti*, or, in English, as hanging, girt, and cocooned. The Pupae of the Peacock, *io*, Brimstone, *rhamni*, and of the Silver-Spotted Skipper, *comma*, are examples of the three types of Pupae. Some writers have based their classification of the Butterflies upon this distinction, and such a division corresponds roughly with the

PUPATION

families as follows: the hanging Pupae are those of the Nymphalids and most of the Browns; the girt are those of the Whites, the Blues, Coppers, and Hair-streaks, the Duke of Burgundy, *lucina*, and the Swallowtail, *machaon*; and the Skippers have cocooned Pupae.

None of our Butterflies make a true cocoon, such as that of the Silkworm Moth. Those which are called cocooned are sometimes almost without silk protection, relying upon concealment among debris of vegetation at, or even under, ground-level. Usually there is, however, some silk fastening of the surrounding materials which justifies the name of cocoon.

The process of taking up the hanging and girt positions by the Larva before pupation is most interesting to watch and, until seen, hard to believe. Whether the Pupa is to hang or to be girt, the insect has two things to do. The Larva has to take the position in which the Pupa will be found, and the Pupa has to shed its larval skin.

When it is to become a hanging Pupa, the Larva spins a pad of silk to the leaf or stem whence it is to hang, and then, after crawling forward until its claspers are on or by the pad, lets go with all the other legs and hangs from the claspers only. It is thus in the position in which the Pupa will be found.

The shedding of the larval skin without losing station is more difficult. Hang by one gloved hand to a horizontal bar. Then set yourself the problem of taking off the glove, without falling, and of course, without using the other hand. There you have the task of the hanging Larva-Pupa. It has to shed its

PUPATION

larval skin, retaining, or rather regaining, its hold with the hooks at the tail (*cremaster*) of the Pupa, so as to remain hanging from the same pad of silk, and not fall to the ground. This gymnastic feat is done by the only quick move of the Pupa's life. The skin of the Larva, as in previous moults, splits at the back of the head, and by a series of alternate swellings and shrinkings the Pupa gradually pushes back this skin until it forms a loose ruff round the final tail segments. It should be noted that a few Pupae, having no tail-hooks, stay thus, keeping the withered larval skin with its claspers fixed in the silk pad. This, however, is not cricket. In all but these few deplorable cases, the process is as follows. The Pupa gets a grip of the larval skin, pinching it between the last two segments on the under side. Then, with the tip of its tail, it pierces through the skin above the place where it is gripped, and takes hold with its hooks of the pad of silk beside the now empty skin of the larval claspers. After this all is simple. A few wrigglings of the Pupa securely fasten its tail-hooks into the silk pad, the grip on the larval skin is released, and the skin soon splits so as to hang clear. Then it dries, shrivels, and falls to the ground, leaving the Pupa hanging.

In the case of the girt Pupa, the taking up of position is the more difficult business. The Larva chooses a stem where the Pupa, when formed, will look like a growing sprout or leaf. It then spins its small pad of silk and crawls up the stem until its claspers are standing on the pad. Then, lying along the stem (head upwards) it bends the upper part of its body sideways and fastens a silk thread with its spinnerets

PUPA

to the stem on one side of its body amidships. It then twists its body round, still bent backward, so that its head carries the silk thread over the middle of its back and touches the stem on the opposite side with it. It continues this motion, the head passing to and fro, always attaching its thread, until a sufficiently thick rope of silk girdles the body. Then the spinning stops (for the last time) and the Larva straightens itself and rests in the position in which the Pupa will be found.

The shedding of the larval skin is similar to that of the hanging Pupa, but less difficult as there is the girdle to prevent its falling. The Pupa has to take up its stand on its tail-hooks where the claspers of the Larva stood.

Shortly after shedding the larval skin, the Pupa, which is then wet, dries and in drying forms a continuous shell of chitin (the hard material of which the shells of all insects are made) without any break in it except the air-holes (*spiracles*), as there is no mouth or vent.

This hard shell or skin shows the position of all the organs of the future Butterfly, the eyes, tongue, antennae, wings, legs, and body. All these can be seen as if through a thin layer of molten glass which has hardened.

Pupae differ much in shape, some being short, squat, and smooth, others long, hairy, and with long, sharp spines or horns. These lessen the jar of hitting against things if the Pupa is swung by the wind. Such horns are found only upon the hanging Pupae.

All our Butterfly Pupae are enclosed in one com-

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plete envelope without appendages. (Such Pupae are termed *obtectae*.) The only exceptions are some of the Skippers, in which the tongue stands out separately from the body, lying along and parallel to it.

In colour and general appearance Pupae usually resemble the buds, flowers, or leaves of the plants to which they are fastened. The less said about the insides of Pupae the better, for very little is known. Before pupation the organs were those of a Larva and after the pupal state is over (it usually takes about a fortnight or three weeks, unless interrupted by winter) the mysterious envelope contains all the organs of a Butterfly. Meanwhile, and during the dissolution and reconstruction which is involved, there is no feeding and only a very restricted breathing and power of movement—this confined to a slight wriggling of the tail end, if the Pupa is touched.

When the pupal stage is complete, begins the 'emergence' as it is called, of the perfect insect: the Butterfly or Imago. This process is dramatic. The skin of the Pupa splits behind the head and from it, slowly and deliberately, the Butterfly crawls, drawing out all its legs, palpi, antennae (which have been formed lying back along the wings), the wings themselves, and lastly the tail end of the body or abdomen. At this stage the wings are small, somewhat flattened bags, filled with blood, and clearly show the 'veins' by which they are to be straightened and strengthened. Very carefully and tenderly it crawls away from the discarded pupa-case (which keeps its form) and takes up a stance in some sheltered spot where, with the wings hanging down, it slowly begins to inflate them.

EMERGENCE

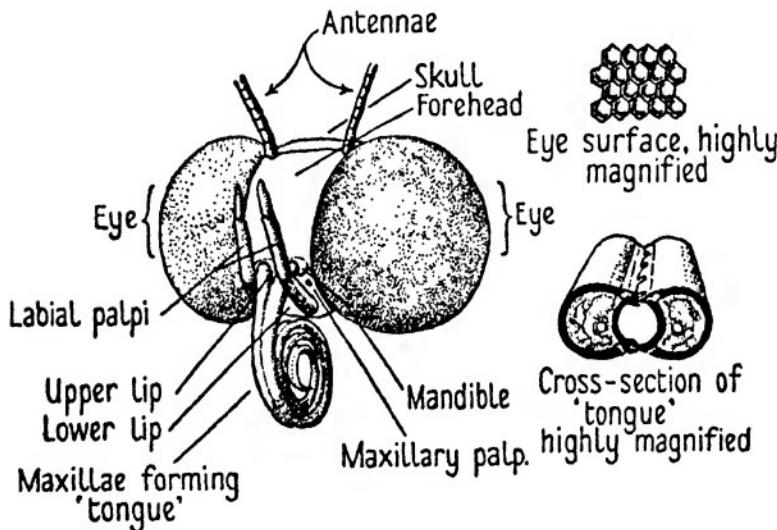
Air is forced down the air vessels which are in the 'veins' and, under its pressure, they spread out fan-wise, extending the area of the wing to some 9 times what it was in the Pupa. During this extension, and because of it, the bag-like membrane forming the wing becomes flattened and the liquid which filled it gets driven back into the body and is discharged through the vent. It is this discharge of a reddish liquid from Butterflies emerging in trees which has given rise to the tales of a rain of blood. This process is hastened by the contraction of countless minute threads which stretch across the wing-bags between the upper and the lower membranes. Gradually the four soft and swollen bags take on the appearance of thin, flat, scale-covered sheets, supported and stretched upon tapering tubular struts. The wings have developed and after a very short time they dry, and can be moved and used in flight. Away the creature flies and begins its new life as a perfect, full-grown, generative or nubile Butterfly. The whole process of emergence will have taken a couple of hours or so.

The body of the Butterfly consists of three parts: the head, the chest or 'thorax', and the belly or 'abdomen'.

The head, though at first sight it looks like that of the Larva, is very different. The two large bumps which were mere skull plates in the Caterpillar are now eyes. The forehead is narrow and, as it were, crowded into a thin band between the eyes. Between and in front of the eyes are two long horns (the Antennae) always clubbed at the ends. All the chewing parts of the mouth have disappeared, or been reduced to

BUTTERFLY

minute vestiges, except the lower jaws (*maxillae*) from which a sucking tube, usually called the 'tongue', has been formed, and the *labial palpi* which have become two short, leglike sense organs. These, in the Butterfly, are called 'the palpi'.



The dozen single eyes of the Larva have (in Butterflies, not in some Moths) disappeared, and are replaced by the large eyes of the adult. These eyes consist of a vast number of separate lenses set side by side between opaque partitions which are hexagonal, so that a microscopic view of the eyes is like a section of honeycomb. Each lens has its own nerve bearing to the brain an image of what is before it. The number of these separate, but contiguous, lenses amounts to many thousands and each is separated from its neighbour by a dark tube in which it lies. Much learning

HEAD

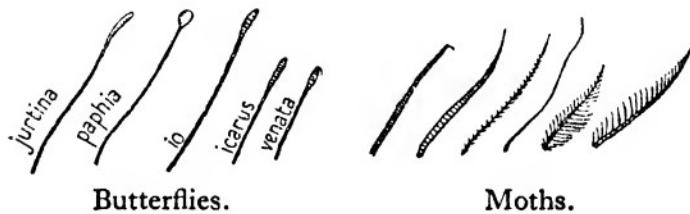
has been devoted to the effect of this separation of the lenses on the resultant image presented to the brain. It has been said that it must give a picture similar to a mosaic, each tessera or bit of glass or stone representing what one lens (the technical term is *ommatidium*) sees immediately before it. However this may be, it appears that there is no power of adjusting the focus, the projecting and spreading shape of the whole complex eye enables a very large angle of vision to be embraced, and insects having such eyes seem, at any rate at short range, to have good vision, particularly of any moving object. Butterflies clearly see both form and colour. Some species have hairs growing all over the surface of the compound eyes. These hairs may to some extent protect the eyes from injury, and presumably do not spoil the sight. The two types are found in very closely related species (e.g. the Wall, *megera*, hairy, and the Scotch Argus, *aethiops*, smooth) and in very different families. It seems odd that neither type should have proved so much the better as to have ousted the other.

The Antennae are organs of sense, almost certainly of smell. They consist of numerous (usually 30 or more) segments and, as before said, their shape is the main difference between Butterflies and Moths. Under the microscope they are in most species found to be covered with scales, at least in part, and to be equipped with many hair-like organs of touch and scent. Although all our Butterflies have clubbed antennae, these vary a good deal, and help in classification. Sometimes the club is hardly noticeable. Sometimes it swells gradually, sometimes rapidly.

BUTTERFLY

Often it is either spherical or ends abruptly. It may be flattened, or hollowed into a spoon, or end in a small recurved hook-like point.

The rough sketch which is given below shows some examples of the various shapes of Butterfly antennae and also some of the Moth antennae which never have the club end.



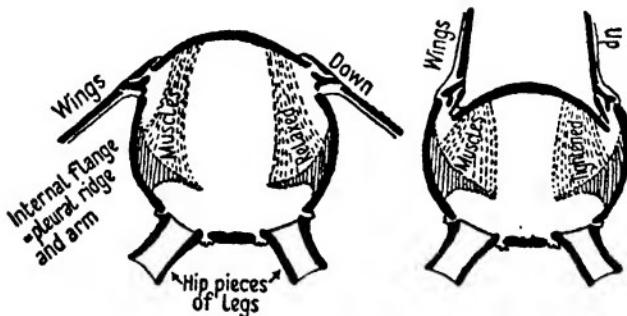
The mouth parts are more simplified than those of any other insects. The mandibles are reduced to mere vestiges, barely visible, and the sole working parts left are the two auxiliary lower jaws (or *maxillæ*) which together form the 'tongue' or proboscis. This is a long tube carried, when not in use, rolled like a watch-spring under the head and unrolled for use in sucking moisture, which is the only food taken by the adult insects. This food, be it remembered, is not needed to provide growth (the monopoly of the Larva) but only to renew the matter consumed by evaporation, movement, and generation. The formation of the tongue is that of a double tube, the two parts hooked together and capable of being separated for cleansing. See the cross-section in the figure on p. 46.

The palpi are the only other head appendages: two short 3-jointed limbs, usually hairy and held forward

THORAX

on each side of the rolled-up tongue, which they serve to protect. They are richly equipped with nerves and organs of scent and touch. There are differences of shape in the palpi which help in the classification of species.

Thorax. Behind the head comes the thorax (formed of the first 3 segments of the Larva) and itself, somewhat inconspicuously, divided into 3 segments (*prothorax*, *mesothorax*, and *metathorax*). This part of the body carries the 6 legs (a pair on each segment) and, on the 2nd and 3rd segments, the 2 pairs of wings, fore and hind respectively. It is not intended in a book of this kind to go into the details of the various hard plates (*sclerites*) of which the body is made, or of its internal muscles, but it is worth while to look at the following rough diagrams of the method of moving the wings. These methods are interesting as showing the complete contrast between the insect and the vertebrate animal.

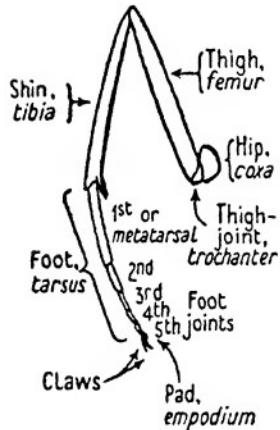


Stated briefly, the Butterfly moves its wing up by pressing the plate across the back down upon the

BUTTERFLY

short end of a rigid lever of which the longer end is the wing itself, and which has as its fulcrum the upper side of the breast-plate. Imagine a knight in armour, unhorsed and lying on his stomach with his arms stretched out. His arms could be worked like a Butterfly's wings by jumping on and off his back. Only in the case of the insect, the breast- and back-plates are brought together by an internal muscular pull, instead of by external pressure.

The appendages of the thorax, then, are the legs and the wings.



The legs, when fully developed, each consist of 9 segments or joints, of which the following sketch gives the general appearance and names.

The 2 claws at the end of the feet are sometimes (in the 'Whites') forked so as to appear as 4 claws, and the fore pair of legs differ much in the different families, forming a main distinction by which to classify.

The wings of Butterflies, and indeed of winged insects in general, are, at first sight, mere flat plates such as might be cut out of thin celluloid or paper. Those of the Butterfly are coloured and opaque, those of a wasp or fly transparent. Both, however, when looked at more carefully, are seen to be strengthened with struts radiating from the body along the wing. These struts vary in number. In some insects they go without branching from the body to the outer

WINGS

margins of the wing. In others they branch and cross one another, so as to form an infinitely complex, lace-like pattern. Of this the best example is perhaps the wing of a Dragon-Fly. Most insects, and the Butterflies among them, have wings which are somewhere half-way between these extremes, having neither the unbranched simplicity of the ribs of a fan, nor the lace-like complexity of those of the Dragon-Fly. They branch and are connected by some crossbars. To see them at all clearly is, in the case of the Butterflies, easy only when the eye is not confused by the colouring. The easiest of all species to see is the Black Veined White, *crataegi* (see p. 322), unfortunately no longer a British species and so relegated to our appendix. From this point of view it has two great merits: it has no diversity of colour except on the struts themselves, and it is very bare of scales, so that the structure is apparent to the naked eye. In some species the structure can only be seen by removing the scales, a delicate operation which destroys the specimen for other purposes. Most species show the wing struts if a drop of benzine be touched on to the wing on both sides. This does not hurt the specimen in any way, if care be taken not to let the benzine get on to the body, whence it may draw out matter which discolours. The difficulty of seeing the structure of the wings of Butterflies and Moths is due to the scales (which are the characteristics of the order of Lepidoptera) to which these insects owe the opacity and colour of their wings.

The next trouble which besets the student is that of language. From this, alas, no relief will come from

BUTTERFLY

deeper study. It is not a beginner's grief. On the contrary, the more he reads the worse will be his confusion. These struts themselves have several names, to all of which good objection can be taken. They are called Ribs, Veins, Nerves, Nervures, and Nervules or Branches. It is worth while to know that some writers distinguish Nervures which start from the body, from Nervules which branch from them. But this happy thought is spoiled by the facts that the struts, always called Nervures by writers who use this word, frequently branch from a common source at some distance from the body, and secondly there is some doubt as to when, if at all, a Nervure becomes a Nervule. Further, the use of two different terms prevents one from having a common name for both which would enable the writer to state the total number of such struts. The microscope reveals some of the facts about these struts. They are hollow tubes; nerves run along them but do not fill them; they act as supports strengthening the wing; while the wing is growing and during the period of development immediately after the emergence of the adult insect, they contain some liquid which dries up when the wing is fully formed; there are air vessels inside and along them similar to those which carry air all over the body; and there is no circulation of blood out and back through them. In other words, they are not mere nerves, they are not veins, they are not mere air-vessels, and they are not ribs. In this book I shall call them 'Veins', always begging the reader to remember that they are nothing of the kind.

Here, however, the difficulties of nomenclature

VEINS

have hardly begun. The experts have wished to give each vein a distinctive name and ever since the idea has prevailed that all species had a common origin, they have felt that these names should be applicable to the whole insect world, so that veins of the same name should be those which are derived from veins of the same name in the common parent. This ideal scheme has gone awry. Such is the fertility of expert invention, the diversity of informed judgment, and the readiness with which the errors of others are acknowledged, that no two writers use the same set of names for the same veins in the same Butterfly. Sometimes the same writer uses two different names for the same vein. This confusion became so bad that an attempt was made to avoid trouble by dropping all names and taking to numbers—and then some numbered from front to back and some from back to front, while others doubled numbers (by counting 1 a , 1 b , 2, 3, &c.) and others again skipped numbers (counting, 9, 10, 12) with the object of making the same number represent the veins in different species which they deemed to be the same, or derived from the same in a common ancestor. So the numbers have gone the way of the names.

In a book for experts the best way is doubtless to say 'I follow the system of the book by "X".' Here I have adopted the only plan which seems to me useful for the non-expert, as follows: I have given a number of sketches of wing structure in all of which I have numbered each vein. This numbering follows one of the systems in vogue, but as it is always before the reader's eye it does not matter which. I have avoided

BUTTERFLY

naming veins whenever possible. When I have used a name I have rigidly kept to the few names which, so far as I know, have never been used to mean different things. This eliminates the words Costal, Sub-costal, Median, Sub-median, and Radial. It leaves only a very few names as follows:

Most Butterflies have, in the centre of the wings, towards the base and extending about half-way to the outer edge, a space of membrane closed by a cross-bar which goes from one vein to another. This area is called the 'Discal Cell' or merely the 'Cell'. The vein which forms its lower edge, that is the side nearest to the tail, is always meant by the name 'Cubital'. Any veins there may be below this (still nearer the tail) are called 'Anal' veins, and though other names are used for them, this name never means anything else. In certain hind wings (e.g. Peacock, *io*, p. 163) there is a small spur branching towards the forward edge of the wing. This is always meant by the name 'Precostal'. I have therefore only three names at my disposal: Cubital, Anal, and Precostal. The vein I should most like to be able to name is that which borders the Discal Cell on the upper side (towards the head) but the rules I have laid down for myself debar me, because the two names in common use (radial and sub-costal) are both used for other veins and I refuse to invent a new name to add to this hideous mess.

For the various parts of the wings the following short vocabulary suffices for this book. The part of the wings nearest the body is the 'base', the 'upper' edges or 'costal' edges are those nearest the head, the

ABDOMEN

'outer' edges are those farthest from the body, and the 'lower' or 'anal' edges are those nearest to the tail. The word 'Apex' is used for the tip of the fore wing between the costal and outer edges.

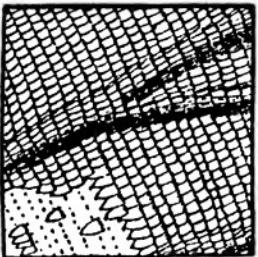
The wing structure is, on the whole, very constant in the species and is therefore much used in classification. A warning must, however, be repeated. The veins are very hard to see, particularly the cross-veins. Often, when a wing from which the scales have been removed is looked at, even with a strong glass, something is seen which either is, or is not, a surviving trace of an obsolete vein, and one is often confused with a mere fold. In giving sketches of the wing structure of all our genera, I have tried, in the accompanying text, to tell when a vein is so faint as to be doubtful.

Behind the thorax comes the **abdomen** which is made up of 10 segments (Nos. 4-13 of the Larva). The first (No. 4) is, in Butterflies, usually small, forming a sort of waist, and has no hard plate in front, and the last 2 segments of the male (3 of the female) are drawn back into the body and reshaped to make the sex organs. These vary greatly in shape and much reliance is placed on them in detecting specific differences. No attempt will be made to describe them here.

The great beauty of the Butterfly (and Moth) lies in the colours which adorn the whole surface of the insect and particularly of the wings, on both the upper and lower surfaces. This colouring is entirely due to the scales with which the surface is thickly covered. If you touch the wing with a finger a

BUTTERFLY

minute dust is rubbed off which 'dirties' the finger and spoils the specimen, leaving the wings more or less transparent and colourless. This dust under a microscope is seen to be made of countless tiny scales, each much the shape of a hand tapered off at



Scales
(highly magnified).

the wrist. The shapes vary much in different species, and in different parts of the body and wings of the same insect. Every shape from that of a long thread-like hair to that of a broad and short paddle (such as those with which butter balls are patted) may be found, but the most usual form for the surface of the

wings is the latter, with the edge farthest from the stalk toothed or indented and the whole surface grooved, and often cross-grooved. They are really all hollow bags, growing like all the other hairs (*setae*) of insects from tiny cup joints formed in the outer skin of the wing membranes. They are either filled with colouring materials, or so minutely grooved and surfaced as to produce by reflection the effect of colour. It is now known that the brown, red, yellow, white, or black scales are filled with definite chemical pigments, products of the blood or excretory organs, while the blues or iridescent colours are due to the shape of the surface, or a combination of shape and pigment.

Many male Butterflies have, in various places, specially shaped scales known as 'Scent-scales' (or *androconia*). These are long and feather-like or broad

A N A T O M Y

and 'battledore-like' in shape and contain glands for making scents, supposedly pleasing to the females. As it seems usually to be the males that seek out and gather round the females (certainly it is so among many of the Moths) it seems odd that the male should be the sex to be visibly perfumed. But so it is, and many such problems remain to be solved.

Of internal anatomy little need be added. Enough has been said of the eyes. The nervous system is more concentrated than that of the Larva (see p. 31) as the subsidiary ganglions are reduced to 6; 2 in the thorax, and 4 in the abdomen. In the Butterfly the stomach and gut of the Larva are much reduced. The tongue-tube communicates directly with the gullet where there is a valve and a power of enlargement which creates a suction in the tube and then, the valve closing the tongue, constriction drives the liquid down to the stomach. All the silk-making organs have disappeared, and the sexual organs are fully developed. The air system is much as in the Larva, but the spiracles in the 11th segment have disappeared, while a new pair in lieu of them appear in the 2nd segment. All the more powerful muscles are in the thorax, being required for the control of the wings in flight.

When we come to the habits and manners of Butterflies a considerable general similarity is found. With few exceptions they are purely diurnal, flying from flower to flower, where they sip the nectar, and usually by preference during bright sunlight. The males of many species usually emerge before the females and seek the latter when they do emerge, finding them partly, it is presumed, by the sense of

BUTTERFLY

smell and partly by that of sight. The males do not appear to die immediately after pairing, nor the females immediately after laying their eggs, though, at any rate in the case of the females, they seem rarely to live very long. Pairing lasts for a considerable time (some hours) and takes place on a leaf or flower head, though if the couple are disturbed they will fly together to another resting-place.

Butterflies usually range over a very small area and remain within it. To this rule there are, however, the migratory species as startling exceptions. Butterflies generally age quickly, the wings becoming torn and losing many scales. This is particularly the case of species which frequent brambles. The duration of a Butterfly's life as such is usually about 3 weeks, though, of course, this does not apply to the species which hibernate in this state. In these (e.g. the Small Tortoiseshell, *urticae*) the Butterfly-life may last over 10 months.

Apart from the rarities mentioned in the Appendix, the migrants visiting Britain are very few. The Large White, *brassicae*, the Small White, *rapae*, and the Green-veined White, *napi*, are all migrants as well as residents. The Small Tortoiseshell, *urticae*, and the Peacock, *io*, are probably also migrants. Three species alone are wholly migrants to our shores, incapable, except under very exceptional circumstances, of surviving through our winter. These are the Red Admiral, *atalanta*, the Painted Lady, *cardui*, and the Clouded Yellow, *croceus*. Probably migration often occurs by night. Migration in Butterflies is odd and hard to fit in with the

HABITS

theory that habits which arise from casual variation are perpetuated by inheritance if they benefit the species. Although there is a little (very little) evidence of returning southward migrations in autumn, these can only be in very small numbers compared with the earlier northward moves, and, if so, it is hard to see how a habit of mass suicide can become a hereditary advantage to a species. It seems as unlikely so to do as the refusal by cyclists to carry rear lights. The whole subject of insect migration is being studied and any one who comes across an instance is asked to communicate with the Keeper of Entomology at the British Museum.

The flight of different Butterflies differs greatly and descriptions of it are difficult. Most of them are of value only as reminders to people who have watched the different species flying and know them. In walking a Butterfly (like most insects) usually moves the fore and hind legs on one side together with the mid-leg on the other. This is followed by a step of the remaining three legs. Where, as in some Butterfly families, the fore legs are not used, the two successive steps are made by a mid-leg on one side and a hind leg on the other moving together.

Food. Although, as above stated, Butterflies suck the nectar of flowers, there are some exceptions.

Some Butterflies seem never to go to blossoms, though they will sip moisture of some kind, seemingly finding it easier to get liquid from a damp surface than from water. One species at least, the Purple Emperor, *iris*, delights in sucking the juices of putrid meat or other decaying animal matter.

BUTTERFLY

One peculiarity of Butterflies needs mention: the existence of what are called 'gynandrous' specimens, here indicated by the use of the two conventional signs for the sexes printed side by side thus: ♂♀. These are hermaphrodites, showing the characters of both sexes. Among Butterflies this usually takes the odd form of one side (either the right or the left) being male and the other female, so that where there is a difference in colouring between the sexes, you get a Butterfly with its right wings those of a male and its left those of a female, or vice versa. These ♂♀ are not infrequent among the 'Blues' and are hardly unknown in any family, though in some very rare.

The general subject of mimicry, or the resemblance of the creatures to their habitual background, can be well studied in all the stages of the Butterfly's life. Though some of the most startling examples are foreign, such as the leaf-simulating Butterfly of India, whose picture adorns so many books on the wonders of insect life, we are not without fine instances among our own species. Hunt for almost any Butterfly's egg upon its food-plant: for the Larva of the Wall, *megera*, on its blade of grass, for the Pupa of a Brimstone, *rhamni*, among the sprouting leaves of a bramble; for the adult Comma, *c-album*, with closed wings, amid russet oak leaves; a Small White, *rapae*, in a flowering bean field; or for an Orange Tip, *cardamines*, closed so as to show only the under side of the hind wing, on the head of a wild carrot, and you will appreciate at its true value the perfection to which nature can carry the art of camouflage.

VARIATION

We have no instance of the 'imitation' by harmless or edible species of the form or colour of others which are dangerous or nauseating—such are to be found among our Moths, but not our Butterflies.

This question brings us to that of variation in general. The universal rule of nature that no two things are just alike applies here as elsewhere. There is no Butterfly of which 'collecting a long series' (which means killing a great many) will not reveal some striking variety. To such freaks some one will have given a name, such as Ab. (= aberration) *pallida*. To some extent variations seem to be due to temperature (particularly during the late larval or pupal stages when the wings are developing), and experiments with ice-boxes and incubators have gone to show that these conditions affect colour. Thus we get what are known as 'seasonal dimorphisms': that is, in English, cases in which Butterflies developed in the spring differ from those developed in the summer, so that, for example, a species having two generations a year has a lighter and a darker colouring in the alternate generations. Almost all the 'Whites' show this peculiarity, the light breeding dark and the dark light, in rotation.

Again, local variations occur either from the same cause (climatic) or because of the benefit derived from looking like different local backgrounds. Good examples of this are those of the Large Heath, *tullia*, and the Grayling, *semele*. When such variations are sufficiently common to be recognized as local they are technically called 'forms', until in the particular locality they completely exclude any others,

BUTTERFLY

when they earn for themselves the title of 'sub-species'. This study of variations of colour patterns is fascinating to many collectors and of interest to students of heredity. Here little can be said of them. Some species vary very little and rarely (e.g. the Peacock, *io*) others much and often (e.g. the Marsh Fritillary, *athalia*). From variation the present species have been born, and where, among different colour patterns, the most advantageous has not yet been found, different varieties coexist.

According to the latest system of nomenclature, *Sub-species* means a local variety which is the only one within its own district; *Form*, one which, though locally the commonest, is found alongside others; and *Aberration* (Ab.) one which is nowhere so general as to be the common local form. *Variety* (with slang plural *vars.*) is commonly used for all the above. The word *Freak*, though expressive, is deemed disrespectful.

There remains one kind of difference between Butterflies of the same species: that between the sexes. Are you made happier by calling this 'sexual dimorphism'? If so, you may. In many Butterflies the colouring of the sexes differs so greatly as to make it hard to recognize them as belonging to the same species.¹ This is markedly the case among the 'Blues'. Others have small but definite distinctions of pattern, an extra black dot or two (several 'Whites'), or again some dash of bright colour, such as the orange tip of the Butterfly of that name, *cardamines*. Usually where

¹ Linnaeus thought the two sexes of the Meadow Brown, *jurtina*, were two different species, naming the ♀ *jurtina* and ♂ *janira*.

SEX DIFFERENCES

there is greater brilliance it is in the male. Almost universally the female is the larger; she has to carry a relatively large burden of eggs and needs the bigger wing-spread. But size is a misleading test, as both sexes vary much and their sizes always overlap. By the way, when an author tells you that the span of a particular species is one inch, try (you may not succeed) to find out how he takes his measurements. It may be from tip to tip of an expanded specimen (this varies with the angle of the wings) or from pin to wing-tip doubled (this is misleading, but exact). As the sizes do differ so, and as there is this confusion, I have preferred to give no figures, but merely to choose for my illustrations (life size) a not unusually large or small specimen. Often the males have the scent-scales above mentioned, and these are frequently clearly visible, as in the Wall, *megera*, or the Small Skipper, *sylvestris*. Sometimes, however, they are hard to see, as for instance in the Black Hairstreak, *pruni*.

Something must now be said about classification and names. All animals (and plants) have, thanks to Linnaeus, two names of Latin form, that of the species and (put before it and spelled with a capital letter) that of the genus to which it belongs, and probably several other species. The generic name may be considered as a surname, the specific as a Christian name, or given name as the Hebrews call it. In this matter, the Butterflies are unusual, owing to the fact that Linnaeus thought them so much alike that he gave them all the surname *Papilio*. It is true that ever since his day writers have been inventing, multiplying, and subdividing genera, but the fact that among

NAMES

Butterflies there was once only one genus has led to a very general neglect of the generic names, and the instability of the later genera has confirmed this habit. If you say *Lycaena* to an entomologist he has no idea what you mean—this generic name has been used for both blues and coppers, for coppers but not blues, and for blues but not coppers, and he cannot remember what it means to-day. But if you say *phleas*, he knows the species you mean. There have been some changes in the specific names, but not many, and by them and them alone the Butterflies are known to any one who has studied them. The other thing in which Butterflies are peculiar is the fact that they have all—all our species that is—had English names given to them. Of course these names are not true trivial names born on the lips of the rustic population at the cross roads, they are text-book writers' labels, like the Latin names. There is some confusion among these names and a few of them, though hallowed by antiquity, are misleading (e.g. Marbled White, and Duke of Burgundy Fritillary) and many are verbose. One, at least, has the merit of paying a compliment, and so making belated amends to an ill-treated lady. The Glanville Fritillary was called¹ after a lady of that name whose will was challenged in the seventeenth century on the ground of her insanity. The evidence against her was that she was interested in Butterflies!

To the novice the disregard of colour by the people who classify Butterflies seems at first almost ludicrous.

¹ The story comes from Moses Harris (1766). It has been suggested that she was the widow of the Speaker of the House of Commons under Charles I, but that lady's will (to be seen at Somerset House) makes this seem unlikely.

CLASSIFICATION

When the Small Blue, *minimus*, and the Small Copper, *phleas*, are so totally unlike in colour, why should a generic difference between them be based upon *minimus* having two veins which appear to cross? The answer is that colour differences, though patent, seem to be comparatively recent and easily varied. Species closely related (e.g. the Camberwell Beauty, *antiopa*, and the Large Tortoiseshell, *polychloros*) are totally different in pattern and colour, while others much alike in colour (e.g. the Duke of Burgundy Fritillary, *lucina*, and the Chequered Skipper, *palae-mon*) belong to different families, whose common ancestor must have been incredibly remote.

As already stated, the differences upon which the Butterflies are mainly divided are structural and include the form of the Egg, of the Larva, of the Pupa, and how the latter is placed, the shape and size of the antennae of the Butterfly, its palpi, its head and body, the structure of the wings, of the fore legs, and of the sexual organs. On the whole, the evidence from the habits of the insects throughout life, and of the larval foods, seem to confirm the deductions from structure.

In 1934 the Royal Entomological Society of London, assisted by the British Museum, published an authoritative list of the British Butterflies, their families, genera, and species. So far, only two of its generic names have been altered (*Satyrus* now *Agapetes*, and *Syrichtus* now *Pyrgus*) and, with these exceptions, it is here followed. It shows 68 species on the 'British list' and also that the single genus *Papilio* of Linnaeus has been split up into 46 genera for these species alone. The 68 species include 10

CLASSIFICATION

which are either extinct, or such rare and infrequent immigrants as not to be, in any ordinary sense of the word, British Butterflies. One (the Large Copper, *dispar*) has been totally extinct, in the form once found here, since 1848, and is omitted. The other 9 still exist somewhere and may conceivably turn up at any time. These I have relegated to an Appendix. This leaves 58 British Butterflies dealt with in the text.

They are divided into seven families of which the following are the names and some of the distinguishing characteristics:

SATYRIDAE (11 species), only 4 walking legs, some wing veins swollen at their bases. Melon-shaped eggs. Larvae, smooth, tubular, grass feeders. Pupae hanging or cocooned.

NYMPHALIDAE (16 species), only 4 walking legs. Melon-shaped eggs mostly with wide keels. Larvae tubular, mostly covered with spines. Pupae hanging and often spiny and covered with metallic spots.

RIODINIDAE (1 species only, a Central American family). Male uses 4 legs, female 6. Otherwise much as Lycaenidae.

LYCAENIDAE (14 species) use all 6 legs, but the fore legs are small and not fully formed in the males. Eggs are mostly flat, round disks. Larvae wood-louse-shaped. Pupae, girt, smooth, and fat.

PIERIDAE (7 species) use all 6 legs—fully developed, with forked claws on the feet. Eggs tall, bottle-shaped. Larvae tubular, smooth, usually feeding on *Cruciferae*. Pupae girt, with horn on head.

OBVIOUS GROUPS

PAPILIONIDAE (1 species only, mainly tropical family) use all 6 legs. Mainly large and swallow-tailed. Egg round, Larva tubular, horned and emitting a scent. Larvae girt. Hind wing has only one anal vein.

HESPERIIDAE (8 species) use all 6 legs. Head large and broad, with 'eyebrows' and short antennae. Wings small for body. Eggs very varied. Larvae tubular and usually living off grass and in a rolled grass-blade. Pupae cocooned, long, and shuttle-shaped. The veins of the fore wings never branch after leaving the cell.

Having thus set out the scientific classification, it will help to give what may be called the obvious classification in English terms. The following groups each include several species:

The 'Browns' are a group of usually feebly flapping woodland species, with some black, white-centred 'eyes' in their patterns and little or no colour other than brown or brownish yellow. These are the same as the *Satyridae*. The Marbled White, *galathea*, is a 'Brown' and should not be confused with the 'Whites'.

The 'Fritillaries' form a compact group of large and small species, of a rich fulvous orange marked with black above, while the under sides are often checkered with metallic silver. Their flight is swift and powerful. They form a part of the *Nymphalidae*.

The 'Blues' are small insects of which the males are usually a brilliant blue, while the females are of

CLASSIFICATION

a sooty brown. Their under sides are usually a delicate grey, spotted with many black-centred white 'eyes'.

The 'Hairstreaks', slightly larger than the 'Blues', are mainly brown above, while beneath they have a thin white line waving across the hind wing. They mostly frequent trees. With the 'Blues' (and the solitary 'Copper', *phleas*) these make up the *Lycaenidae*.

The 'Whites' are mostly largish insects and (except for *galathea*, above mentioned) are our only Butterflies which are largely white in colour.

The Yellow Butterflies are included with the 'Whites', and together they make up the *Pieridae*.

The 'Skippers' are very small, brown or fulvous insects, recognizable mainly by their fast, short flight at ground-level, which has earned them their name. These are the *Hesperiidae*.

The above groups leave only a small number of species unclassified, most of which may be covered by the term 'The Aristocrats'. These have so much individuality of colouring that one does not easily group them. Nearly all will be found among the *Nymphalidae*. Such are the Purple Emperor, *iris*, the Admirals (Red, *atalanta*, and White, *camilla*), the Painted Lady, *cardui*, and the Comma, *c-album*. The one Butterfly which is not a *Nymphalid* and to which the title of 'Aristocrat' would certainly not be denied is the Swallow-tail, *machaon*, here the sole surviving bearer of Linne's generic surname *Papilio*.

USUAL FOOD-PLANTS OF THE LARVAE ARRANGED BOTANICALLY

Note. The plants are named by their English names according to the *Flower Book for the Pocket* in this series, the scientific name being added for wild species not in that book.

The Butterflies are named by the latin specific names alone.

CRUCIFERAE (Wallflowers): Water cress and charlock: *napi, brassicae, rapae.*

Winter-cress, cuckoo-flower, hedge-mustard, and garlic-mustard: *napi, brassicae, rapae, cardamines.*

Horse-radish: *brassicae, rapae, cardamines.*

Garden-honesty (*Lunaria biennis*): *cardamines.*

Cabbage, mustard, turnips, and garden 'nasturtium': *brassicae, rapae.*

RESEDACEAE (Mignonettes): Wild mignonette and dyer's weed: *brassicae, rapae.*

CISTACEAE (Rock roses): Rock rose: *agrestis, rubi.*

VIOLACEAE (Violets): Dog violet: *euphrasyn, selene, aglaia, cydippe, paphia.*

And others of this family: *aglaia.*

GERANACEAE (Crane's bills): Storksbill: *agrestis.*

RHAMNACEAE (Buckthorns): Buckthorn: *argiolus, rubi, rhamni.*

Alder buckthorn: *rhamni.*

LEGUMINOSAE (Peas): Petty whin: *argus.*

Gorse and broom: *argus, argiolus, rubi.*

Dyer's greenweed, dwarf gorse, and runner beans: *rubi.*

Rest-harrow and bird's-foot: *argus, icarus.*

Black medick: *icarus.*

Clover: *croceus, icarus.*

Lucerne: *croceus.*

Kidney vetch: *minimus, coridon.*

Horseshoe vetch: *coridon, bellargus.*

Bird's-foot trefoil: *coridon, rubi, sinapis, tages.*

Tufted vetch, bitter vetch (*Orobus tuberosus*), meadow vetchling, everlasting pea, and sweet pea: *sinapis.*

Garden pea: *rubi, sinapis.*

ROSACEAE (Roses): Blackthorn: *betulae, pruni.*

Cherry: *polychloros.*

Bramble: *argiolus, rubi, malvae.*

Raspberry, wild strawberry, silver-weed, and agrimony: *malvae.*

Whitebeam and pear: *polychloros.*

SAXIFRAGACEAE (Saxifrages): Escallonia: *argiolus.*

UMBELLIFERAE (Parsleys): Milk parsley (*Poecilanthemum palustre*), wild carrot, wild angelica, and others: *machaon.*

ARALIACEAE (Ivys): Ivy: *argiolus.*

CORNACEAE (Dogwoods): Dogwood: *argiolus, rubi.*

FOOD-PLANTS OF THE LARVAE

CAPRIFOLIACEAE (Honeysuckles): Honeysuckle: *camilla*.

DIPSACEAE (Teasels): Devil's bit: *aurinia*.

COMPOSITAE (Daisies): Spear-, musk-, ground-, and field-thistles: *cardui*.

ERICACEAE (Heaths): Scottish, and bell, heathers: *argus*.
Cowberry and whortleberry: *rubi*.

PRIMULACEAE (Primroses): Primrose and cowslip: *lucina*.

SCROPHULARIACEAE (Foxgloves): Foxglove: *aurinia, athalia*.
Common cow-wheat: *athalia*.

LABIATAE (Mints): Wild thyme: *arion*.
Woodsage: *aurinia, athalia*.

PLANTAGINACEAE (Plantains): Sea plantain and ribwort plantain: *cinzia*.
And other species of plantain: *aurinia, athalia*.

POLYGONACEAE (Docks): Sheep's sorrel: *phleas*.

ULMACEAE (Elms): Common elm: *polychloros*.
Wych elm: *polychloros, w-album*.

URTICACEAE (Nettles): Stinging nettle: *atalanta, urticae, io, c-album*.
Pellitory-of-the-wall: *atalanta*.
Hops: *atalanta, c-album*.

BETULACEAE (Birches): Birch: *polychloros*.

FAGACEAE (Beeches): Common oak and Spanish chestnut: *quercus*.

SALICACEAE (Willows): Sallow: *polychloros, iris, quercus*.
Willows (various species) and aspen: *polychloros*.

GRAMINEAE (Grasses): Cat's-tail: *galathea, sylvestris, lineola, acteon*.
Tufted hair-grass: *semele, hyperanthus, comma*.

Early hair-grass: *semele*.

Soft grass: *acteon, sylvestris*.

Yorkshire fog: *sylvestris*.

Crested dog's-tail: *pamphilus*.

Purple moor-grass: *aethiops*.

Cock's-foot: *aegeria, megera, galathea, hyperanthus, tithonus*.

Annual meadow-grass: *aegeria, megera, galathea, semele, jurtina, pamphilus, tithonus, hyperanthus, acteon*.

Wood meadow-grass (*Poa nemoralis*): *pamphilus*.

Sheep's fescue: *galathea, semele, comma*.

Barren fescue (*Festuca bromoides*): *semele*.

Meadow fescue (*Festuca pratensis*): *pamphilus*.

Hairy brome-grass (*Bromus asper*): *palaemon*.

Heath brome-grass (*Brachypodium pinnatum*): *sylvestris, acteon, lineola*.

False brome-grass: *hyperanthus, palaemon, acteon, venata*.

Couch-grass: *aegeria, semele, hyperanthus, lineola, tithonus*.

Mat-grass: *epiphron, pamphilus*.

Beaked rush (*Rhynchospora alba*): *tullia*.

Millet-grass (*Millium effusum*): *hyperanthus*.

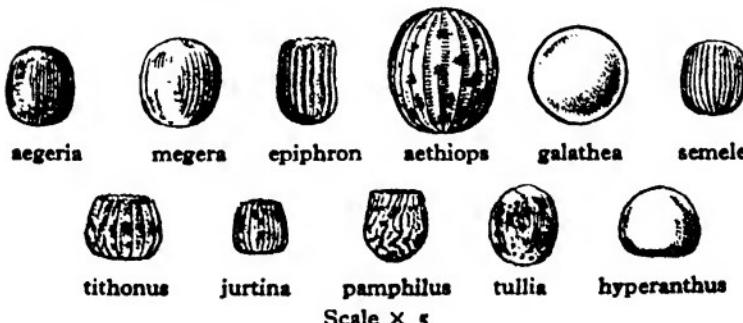
FAMILY SATYRIDAE

THE BROWNS

These Butterflies all, except the Marbled White, *galathea*, bear a strong family resemblance in general appearance and are all brown in colour, with few, if any, other colours upon them. They usually have some white-centred 'eyes' decorating the wings. Their flight is in most cases slow, fluctuating, and feeble and, except for some arctic (or with us mountain) species, they are mostly woodland dwellers. In the great majority of the species the undersides of the two sexes are alike and so coloured as to make the insect almost invisible when resting, with closed wings, against the backgrounds chosen. Where not so coloured, they rest, completely hidden, in thick cover.

The Eggs are mostly melon-shaped, grooved, and flattened at the base, or on top, or both. They are laid singly on grass blades. Those of the Marbled White, *galathea*, and Ringlet, *hyperanthus*, are more spherical and are scattered broadcast over the grass.

In colour the Eggs are usually pale green or pale yellow and gradually are darkened by brown or purple markings before hatching. Those of the Marbled White, *galathea*, are, and remain, a pure white.



THE BROWNS

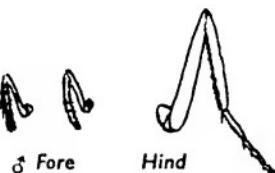
The **Larvae** are tubular, tapering towards both ends. They are covered with down and have no horns or excrescences, except for two points towards the rear, which form a forked tail. They all live wholly upon the various species of grasses. They are all species which winter as Larvae. To this statement there is only one partial exception. The Speckled Wood, *aegeria*, has the peculiarity, unique among all our Butterflies, that it sometimes winters as a Larva and sometimes as a Pupa. The Browns do not have an unbroken sleep throughout the winter months. All through the year there is some grass growth which enables them to wake up and resume nibbling whenever the winter days are relatively warm. Most of our species have only one generation in the year.

The **Pupae** are stubby and blunt ended, without spines or any marked projections. Six of our species are found hanging: 4 by tail-hooks to a silken pad, and 2, which are without hooks, with the help of the remains of the larval skin. The remaining 5 species are hookless and are found lying on, or sometimes under, the surface of the ground. In this case they are protected by a slight silken shelter in the nature of a loose cocoon.

The **Butterflies** have relatively small heads. The eyes of some species are hairy, others naked. The antennae are usually short and slender with clubs distinctly visible, and varying in thickness. The palpi are narrow and rather long, with the last (3rd) joint hairy. Their abdomens are small. Like the *Nymphalidae* they are four-legged, only the middle and hind legs being used in walking. The fore legs of both

FAMILY SATYRIDAE

sexes are atrophied, apparently useless, and carried folded under their heads. The fore legs of the males have only one joint in the foot and those of the females, though divided into several joints in the foot, are equally small and useless, and are without claws. In the structure of the wings they also resemble the *Nymphalidae* in the following respects. Both families have more than one anal vein in the hind wings (Nos. 1 a and 1 b in the sketch below) and both have 12 veins in the fore wings, of which 5 (Nos. 6-11) all branch from the vein which forms the upper edge of the discal cell. The distinguishing mark of the family is that all its members have one, two, or three of the main veins dilated at the start, where they leave the body. This seems to be an effort to compensate for the weakness of the general framework of the wings of this family.



GENUS PARARGE Hübner

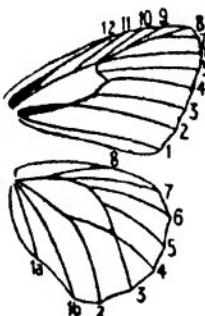
Two species, *aegeria* and *megera*.

Eggs. Melon-shaped, flattened at both ends, minutely patterned.

Larva. Big-headed, downy, and green.

Pupa. Hanging.

Butterflies. Eyes hairy. Wing-structure: either 1 or 2 dilated veins. Our species both have 2. The sketch here given is that of *aegeria*.





SPECKLED WOOD

AEGERIA



SPECKLED WOOD

Pararge aegeria

Habitat. Most of Europe except the Arctic, and in N. Asia Minor, Armenia, and Syria, and N. Africa. Here, resident, mainly in the S. and W. Very rare in Scotland: common in Ireland. Not in Man.

Haunts. Woodland. Increasingly local, lacking where once common.

Description. Larva. Two tail-points are white with grey hairs.

Food-plant. Various grasses, mainly coarse, such as cock's-foot, couch-grass, and annual meadow-grass.

Pupa. May be duller and browner. Has 2 conical points at the head. Hangs by tail-hooks from pad of silk on a grass stem.

Butterfly. The sexes differ slightly. Males are smaller, have the fore wing more pointed and upon it a patch of scent-scales absent in the female. Their yellow marks are smaller and more ill defined. In both sexes the hind wings have often only 2 white-pupilled and 1 black-dotted eye, instead of 3 and 1 as here figured.

Varieties. Our form is called *aegerides* and is the commonest except in SW. Europe, Syria, and Africa, where the type has rich orange instead of the pale yellow. This orange type has been found in Sussex and Cornwall.

There is much minor aberration, usually taking the form of decrease in size and number of yellow spots of the males and increase in those of the females. The yellow is often darker in S. England and paler in N. Ireland.

SPECKLED WOOD

Life cycle. Unusually variable. Usually 2 generations a year, some of the autumn Larvae wintering as such, others as Pupae. In hot years 3 generations may be produced.

It is the only British Butterfly which certainly thus winters in two different stages.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----			Pupa---	Butfly Eggs--	Larva-						
Pupa-----			Butfly Eggs--	Larva--	Pupa--	Butfly Eggs--	Larva-----				
			Larva--	Pupa--	Butfly Eggs--	Larva-----	Pupa-----	Butfly Eggs--	Larva-----		
Some wintering thus: some thus: and, sometimes, in hot years:											

Life history. The Eggs are laid singly on the blades of the food-plant grasses and hatch in 9 or 10 days. The Larvae first eat all the eggshell except the base, and then the grass on which the egg was laid. They feed night and day, moult 3 times, and take about 30 days to attain full growth and pupate. When cold weather catches them before pupating, they do not really hibernate but feed at intervals whenever it is mild enough. The larval stage may thus be prolonged for 6 to 8 months. For the final days before pupating they feed continuously, then spin a pad of

PARARGE AEGERIA

silk on a blade of grass and hang from it in a bow shape. The **Pupae**, hanging by tail-hooks from the silk pad, complete the process of change in about a month, unless winter interrupts it, when it will not be resumed until March or April.

The **Butterflies**, owing to the complication of the time-table above set out, may be found flying at almost any time from the end of March until November. They avoid strong sunlight, prefer damp climates, and seem to prosper in wet years. They will even face stormy weather. They feed on flowers such as bramble blossoms. The flight is restless, fluttering, and wavy. They are not shy and when driven away will come back to the same spot. Life span about 20 days.



WALL

MEGERA

WALL

Pararge megera

Habitat. Most of Europe except the Arctic, Asia Minor, Armenia, and N. Africa. Here, resident, all over the U.K. up to Aberdeenshire, becoming less numerous as one goes north.

Generally a very common species, but subject to unexplained and sudden local disappearances where previously common, regaining a footing after an interval.

Haunts. Wayside banks, walls, and hedgerows.

Description. Larva. Differs from that of the Speckled Wood, *aegeria*, thus: slightly smaller, the pale flank lines more distinct and dark-bordered, tail-horns greenish, tipped white.

Food-plants. Most common grasses, such as annual meadow-grass and cock's-foot.

Pupa. Colour varies from pale green (usual) to dark brown or black, always showing the yellow or white dots.

Butterfly. Sexes differ, females being usually larger and having the fore wings more rounded. The patterns are the same except that the males have a stripe of dark scent-scales crossing the fore wings, which the females have not. There is not much common variation in pattern. Such as there is is usually in the 'eyes' on the fore wings, which are sometimes double-pupilled, and sometimes more in number (up to 4). Often the last (anal) 'eye' on hind wing is blind.

Varieties. Very rarely the fore-wing 'eye' is lacking. Some are partly albino, the yellow being pale or whitish. An aberration with much more black on the fore wing has been found on Dartmoor and in Pembroke.



WALL

Life cycle. Two generations a year, in long summers three. Wintering as Larvae. Possibly in warm winters pupation takes place in (or before?) winter.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva				Pupa Butfly Eggs Larva							
In hot years:		Pupa Butfly Eggs Larva			Pupa Butfly Eggs Larva						
				Pupa Butfly Eggs Larva				Pupa Butfly Eggs Larva			
									Pupa Butfly Eggs Larva		

Possibly weather which encouraged the production of a 3rd yearly brood and then, by a sudden change to cold, killed them or their eggs, may account for local extinctions of the species recorded. In warmer climates, they appear to breed continuously through the whole year.

Life history. Egg, Larva, and Pupa stages are like those of the Speckled Wood, *aegeria*, save that the Larva feeds only at night. Only 50-60 Eggs are said to be laid. The usual duration of these stages (except for the winter suspension) is 10, 35, and 14 days respectively.

The Butterflies differ widely from *aegeria*. They seek and need full sunlight, basking in lanes and on

PARARGE MEGERA

hedgerows and walls. Their habits are restless and flight rapid but short. They have a trick of rising, disturbed, as a walker passes and flying on a few yards, repeating this until they have accompanied him a long way. They feed from all wayside flowers. Life span about 20 days.

GENUS EREBIA, Dalman

Two species, *epiphron* and *aethiops*

Eggs. Melon-shaped, markedly fluted, differing much in size.

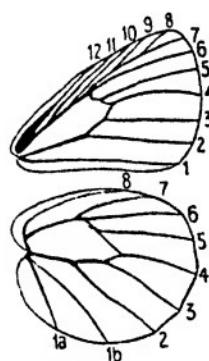
Larva. Small-headed, downy, green or buff, forked at the tail, markedly stripy. Grass feeders.

Pupa. On the ground with a loose cocoon.

Butterflies. Head of moderate size, antennae end in a flat oval club. Eyes smooth. Males with or without scent-scales. Wing-structure: 1 dilated vein. There is much variation, more especially in the starting-point of Nos. 6-10. Species cannot be thus distinguished. The above is a sketch of the wings of *aethiops*.

The genus is arctic and was left by the receding ice age on mountains where it is alone found to-day. Unlike most 'Browns', they are not found in woodlands.

Though it is usual to speak of their life cycle as annual, there is some reason to suspect that most, if not all, species (including both of ours) spend not 10 but 22 months as Larvae, the flight of (say) 1938 being that of eggs laid in 1936. Some clearly winter for 1 year only, but, unless 2 years' hibernation is usual, it is hard to account for the fact that in some places species are abundant in even years, and scarce in odd years (or vice versa).





SMALL MOUNTAIN RINGLET

Erebia epiphron

Habitat. Resident on almost all European and many Asiatic mountain ranges. In Britain in two districts, the Lake District and the Western Grampians. Also recorded from County Mayo, Ireland.

Description. Larva. Green with darker and conspicuous whitish lines. Two buffish tail-points.

Food-plant. Mat-grass, the leaf-tips alone being eaten. As a captive it will eat softer grasses, such as annual meadow-grass, sheep's fescue, and early hair-grass.

Pupa. Pale green or yellow. Without tail-hooks. Merely lies down among grasses loosely fastened together by silk threads, so as to form a rough shelter.

Butterfly. Females larger than males. Sexes differ very little in pattern, the females being slightly lighter and more distinctly marked, the males having whiter legs and antennae. There are no male scent-scales.

The species as a whole varies much in the 'eye' markings on the upper sides. Speaking very generally these are either 'well marked', that is, having the rings round the black spots clearly separated and 4 or 5 in number on the fore wings and 2-4 on the hind (Northern type) or else 'poorly marked', that is, with a faint band only or even none (Southern type). Both are found in this country.

Varieties. Sub-spe. *E.e. mnemon*. Habitat Britain. Belongs to the Northern type above mentioned, having on fore wing 5 rings, the 3rd often small and out



♂



♀



♀

SMALL MOUNTAIN RINGLET

EPIPHRON

SMALL MOUNTAIN RINGLET

of line, and on the hind wing 3 or 4 rings. These central black dots are very rarely white-pupilled. Under sides with black spots often white-pupilled and the bands of red rarely broken into rings. Those here figured are from Scotland, the English specimens are usually slightly smaller and less well marked. Ab. *E.e.m. obsoleta*. Rare. Upper surface without any marking. Some albinistic specimens occur, having one or more whitish wings.

Sub-spe. *E.e. aetherius*, form *nelamus*. Habitat higher Alps and Ireland. Southern type; smaller; the fore wing has a faint undivided and unspotted band, or even none; hind wing is unmarked.

Identification. Much smaller than the Scotch Argus, *aethiops*, our only similar species.

Life cycle. One generation in a year (or perhaps 2 years, see p. 81), hibernating as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa Butfly Eggs						

Life history. The Eggs are laid singly upon the food-plant and are said to take 18–20 days to hatch. The Larva first eats the eggshell and then starts on the food-plant. From September to early March it hibernates and thereafter feeds on warmer days, chiefly by night. Three moults. The Pupa is found at the base of the grass stems which are loosely

EREBIA EPIPHRON

fastened together with silk in a sort of cocoon. It lasts about 21 days.

The **Butterflies** fly only in sunlight, disappearing into the stalks of the grass stems or heather whenever a cloud passes over. Flight low, not above 4 feet, but fairly long. Life about 20 days.



SCOTCH ARGUS

Erebia aethiops

Habitat. Central and S. Europe, Asia Minor, Armenia, and S. Siberia. Here in N. England in Yorkshire, N. Lancs, Durham, Westmorland, and Cumberland, and in most of Scotland up to Forres and in Arran, Mull, and Skye. Not in Ireland.

Though living in hills, not upon the tops, but on rough hill-sides or moors, near woods, on damp soil with long grasses and sparse trees. Prefers sheltered valleys and particularly the sides of woods facing down to the morning sun.

Description. Larva. Slug-shaped. Minute hairs are white, brown-tipped, and single pointed.

Food-plant. Purple moor-grass and, probably (certainly in captivity), annual meadow-grass and other grasses.

Pupa. Without tail-hooks, found standing in a hollow on the ground among the grass stems and covered with a loose silk cocoon.

Butterfly. Two forms of the typical sub-spe. *E. ae²*. are found here in both of which the sexes differ in size, females being usually larger than males. In appearance, the males are usually darker both in the velvety brown colour and in the red bands, the latter and the white-pupilled eyes of the females being larger. The 2 forms, both found throughout the distribution of the sub-spe., are:

Sub-spe. *E. ae²*. Typical Form as here figured. The red bands of the fore wing often extend down to the 1st vein, though they may end in disconnected spots at the lower ends. They have 3 pupilled eyes and often a 4th. The 4th is smaller and sometimes unpupilled. On the hind wing the band is broken

EREbia aethiops

moult 3 times. It feeds night and day until the last stage when it feeds only at night, lying at the base of the grass till sunset and climbing up to the tips to feed at night. When ready to pupate a slight depression is dug and a loose cocoon spun over itself, and it rests tail down in the hollow to pupate. The Pupa is fat and sparsely bristled, and lasts for about 16 days.

The Butterflies fly only in the sunlight, hiding at the roots of the grass whenever a cloud passes. The comparatively conspicuous colouring of the females is presumed to help the males (usually the earlier to emerge) to find them. One writer describes their 'disappointed air' when misled into making advances to a dead leaf by its likeness to the female. Life about 21 days.

GENUS AGAPETES Billberg

One species, *galathea*

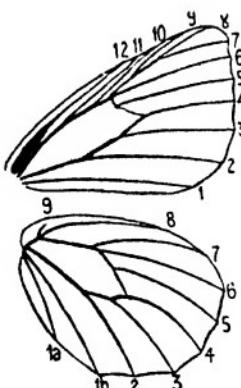
Eggs. Spherical and scattered promiscuously.

Larva. Long and slug-shaped, with forked tail.

Pupa. Not suspended, lying on ground.

Butterflies. Antennae long, gradually enlarged into a club tapering at both ends. Palpi slender, last joint not hairy. Eyes smooth. Wings rounded and but slightly indented in the hind margins. Wing structure: 1 dilated vein.

Mainly a southern genus, *galathea* alone (of 8 European species) coming as far north as England.





MARLED WHITE

GALATHEA

MARBLED WHITE

Agapetes galathea

Habitat. Central and S. Europe, except the Peninsula, and Asia Minor. Here, somewhat local, but not uncommon in the south of England and Wales up to E. Yorkshire. Commonest on chalk, but also present on limestone and clay soils.

Haunts. Rough ground, grass slopes, hill-sides, and meadows and, sometimes, clearings in woods or on the outskirts of woods.

Description. **Larva.** Round-headed, slug-shaped with forked tail. Colour pinky-buff to pale green, with dark stripes.

Food-plant. Preferably sheep's fescue grass, but this and cat's-tail, cock's-foot, annual meadow, and other grasses are freely eaten.

Pupa. Yellow, with 2 small black horns. No tail-hooks, but club-shaped spines on the tail. It lies on the ground under grass. The female Pupa, figured, is some 3 mm. longer than the male.

Butterfly. As well as in size, the sexes vary in colouring on the under sides. In both sexes the paler colour varies on both sides from almost pure white to a primrose-yellow—and the markings on the under sides from pale olive to a dark brown. Also they vary in the extent to which the longer white hairs modify the black parts of the wings. It should be noticed that this is our only species, except among the *Pieridae*, in which there is any considerable area of white scales. From these it differs in having only 4 working legs, a family characteristic of the 'Browns' to which it belongs.

Varieties. Marked variation is rare here. Such



MARBLED WHITE

variety as exists in the species takes the form of more or less blackness. These changes of balance between the two colours give sometimes the effect of a black Butterfly with white markings, and sometimes that of a white Butterfly with black markings. The two extremes have each once been found here. A completely black Butterfly, with no white, was taken in 1871 near Rochester and was given the name of Ab. ♂ *turcica*; and the opposite extreme, a pure white albino, was captured near Dover in 1843.

Life cycle. One generation a year, hibernating as new-born Larvae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa						
					Bu'fly	Eggs	Larva				

Life history. The Eggs are scattered broadcast by the mother and not carefully placed as by most other British Butterflies. They are not sticky and take about 20 days to hatch. The Larva, after eating a circular lid in the egg and emerging, eats the eggshell and then seems to hibernate at once, choosing dead grass stems (not green ones) on which to rest. It remains dormant for but a short time, waking to feed on warm days in January. It feeds by day and rests along the grass stems at night. It moults 3 times and attains full size in about $9\frac{1}{2}$ months, when it lies down

AGAPETES GALATHEA

on the ground and pupates in 3 or 4 days. The Pupa lasts 15–25 days.

The Butterflies are usually gregarious and local. They are numerous in favourite fields. They are slow, feeble, and short fliers, easily caught, at any rate upon their own ground, although reported to be capable of longer and swifter flight when found away from the local colony-fields in which they usually live. Life about 20–30 days.

GENUS EUMENIS Hübner

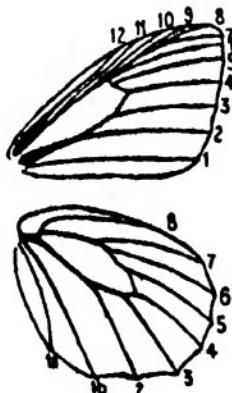
One species, *semele*

Eggs. Melon-shaped.

Larva. Smooth, with rounded head.

Pupa. Buried beneath the surface.

Butterflies. Large or medium sized. Antennae rather long with distinct clubs rounded at the end. Palpi short, covered with thick hairs; last joint short and pointed. Eyes smooth. Fore legs short and slender, very hairy in the male; foot single jointed. Male has scent-scales on the fore wings. The fore wings are pointed, the hind wings round and but very faintly indented. Wing structure: 2 dilated veins.





GRAYLING

SEMELE



GRAYLING

Eumenis semele

Habitat. Throughout Europe (except the Arctic) and also found in N. Africa, Asia Minor, Armenia, Madeira, and the Canaries. Here, fairly general but local. Not recorded from any of the Scottish Isles.

Haunts. Rough stony ground, hills, rocks, heaths, or sand dunes.

Description. Larva. Smooth, with rounded head and forked tail. Pale yellow with brown and black wavy lines.

Food-plant. Grasses. The eggs are usually laid on barren fescue grass (*Festuca bromoides*), sheep's fescue grass, early hair-grass or tufted hair-grass. Larvae also eat other grasses, such as annual meadow-grass and couch-grass.

Pupa. Rich red-brown, unmarked: lying in a hole beneath the ground. No tail-hooks.

Butterfly. On the upper side the sexes differ markedly. The male has a dark band of scent-scales across the fore wing. The under side of the male's fore wing is paler than that of the female. The under sides are among the most remarkable examples of camouflage exhibited by any of our Butterflies. When the insect closes its wings, laying the fore wings back between the hind wings, it is almost invisible against earth, rock, or tree trunk.

Varieties. Some variation in the colouring of the under sides, dependent upon the nature of the local soil, has been noticed. The general effect being darker in those in moorland sites, paler on sand-dunes, and whiter on chalk soil. These variations are not, how-

GRAYLING

ever, invariable, examples of the wrong colouring being found in each situation.

Variation also occurs on the upper side, particularly in the number and size of the 'eyes', some or all of which may be white-pupilled or blind.

Life cycle. One generation a year. Wintering as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa	Butterfly	Eggs	Larva			

Life history. Eggs are laid, singly, upon the grasses and hatch in about 17 days. The Larva at first seems to feed both by night and day and does not really hibernate, but, after its 2nd moult, remains torpid during cold weather, feeding at night only if warm, resting during the day, head down along the lower part of the grass stems. When nearly full grown (about mid-June) and 28-31 mm. long, it burrows, making a hole some half an inch below the surface, from which it comes out at night to feed. This hole is loosely lined with silk. In it the Pupa lies underground and, in about 4 weeks, the Butterfly crawls out.

The Butterflies behave unusually in several respects. They rarely fly unless disturbed, and then make a short swift flight of some dozen yards and then again settle, seeming completely to vanish. Their main need seems to be invisibility. Their likeness to

EUMENIS SEMELE

a stony or bare spot of earth is wonderful, and they take advantage of this by settling on a suitable background, closing the wings, with the fore wings laid back between the hind. They even turn over sideways so as to avoid casting a shadow. They sometimes settle on bracken, but they never open the wings except in flight and do not visit flowers. They have been seen on the trunks of firs sipping resin, and they come to trees 'sugared' by Moth collectors. They appear to enjoy heat and drought and are never found seeking moisture. Life about 4 or 5 weeks.

GENUS MANIOLA Schrank

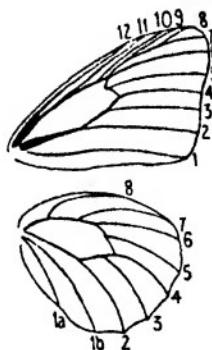
Two species, *jurtina* and *tithonus*

Eggs. Melon-shaped, but cut off at both ends, more so at the base, and fluted.

Larva. Downy, grey or green striped, head globular and larger than 1st section, body tapering sharply to head, gently to forked tail. Grass feeders.

Pupa. Suspended.

Butterflies. Antennae rather long, club slight. Palpi longer than head with hairy joints. Eyes smooth. Front legs very short, slender, and hairless. Thighs of other legs smooth in females. Hind wings moderately indented and slightly incised near anal angle. Wing structure: 2 dilated veins.





MEADOW BROWN

Maniola jurtina

Habitat. All Europe (except the Polar regions), Asia Minor, N. Africa, and Canaries. Here, everywhere except in the Shetlands.

Haunts. Wherever there is grass, on field, moor, common, lane, or garden. Our commonest Butterfly. Everywhere except in city streets and on high tops.

Description. Larva. Head round and larger than 1st segment. Tapering to both ends, forked at tail. Green, darker beneath.

Food-plant. Grasses, annual meadow-grass and others.

Pupa. Green with dark brown marks. A bunch of straight hairs at the tail. Suspended from the remains of the larval skin.

Butterfly. The sexes differ so greatly that they were long deemed separate species, and were so treated by Linnaeus.

Variation. There is much minor variation in both sexes, chiefly in the 'eye' spots. That of the male may be more or less markedly ringed with orange and below it may be one or two faint orange spots, or even a continuous orange band extending to the 2nd vein. On the male hind under wing the 2 black dots may be absent, or there may be a third.

In the female, the extent of the orange clouding of the upper fore wing varies and the 'eyes' may be single pupilled. Dots on the under hind wing occur, but more rarely than in the male.

There is, in both sexes, a tendency to partial albinism, white scales taking the place of brown ones on parts of some or even all of the wings. ♂♀ forms are very rare.



MEADOW BROWN

JURTINA

MEADOW BROWN

Life cycle. Normally one generation a year, wintering as Larva. In hot summers, sometimes two.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva				Pupa	Butterfly Eggs	Larva					
In hot years:				Pupa	Butterfly Eggs	Larva	Pupa	Butterfly Eggs	Larva		

Life history. Eggs are laid singly on the grasses and hatch, slowly, in from 14 to 30 days, usually about 24. The Larvae eat a hole in the side of the egg and after coming out eat most of the rest of the shell. They feed at night only, passing the days curled up at the base of the grasses. There is only a partial hibernation, the larvae feeding whenever the weather is warm. They moult 5 times. When about to pupate, the Larva spins a pad of silk low down on a grass-stem and grips this with its hind legs, hangs thus for 2 days and then pupates, the Pupa remaining attached to the shed skin of the Larva. The pupal stage takes from 25 to 30 days.

The Butterflies. One of our commonest Butterflies, above all others suited to our variable climate, as it does not seem to dread sun or rain. It may be seen to fly in sunlight, gloom, or even in a sharp thunder-storm. The flight is short and fluttering, the wings

MANIOLA JURTINA

seeming to touch each other at the top of the stroke, and the body to jerk up and down as the insect flies. It has almost exactly the appearance of a dead leaf drifting along in the light breeze. They have been seen to go to trees for some shelter in rain. Life about 21 days.



HEDGE BROWN

Maniola tithonus

Habitat. Most of Europe except the NE., also the north part of Asia Minor. Here, resident, rather locally, in the S. and W. of England and Wales and in parts of SE. England, rarer and even absent in the Midlands. In Scotland, reported as abundant in Kirkcudbright and scarce up to Argyll and Fife. Only in south Ireland.

Haunts. Particularly in hedgerows (hence 'Hedge Brown'), but also in grassy wood rides, and on rough ground by sea cliffs.

Description. Larva. Slug-shaped, with bilobed head and forked bristles. green, with faint darker stripes and broken dashes.

Food-plant. Various grasses, mainly annual meadow-grass, cock's-foot, and couch-grass.

Pupa. Wide-shouldered, pale cream coloured with dark marks. Hanging as does that of the Meadow Brown, *jurtina*, from the cast larval skin.

Butterfly. Sexes differ markedly in size, the females being much larger. Also the males have the dark brown cloud surrounding a patch of black scent scales on the upper side of the fore wing.

Varieties. There is much minor variation, hereditary because local, in the 'eye' spots in both sexes. On the fore wing there is sometimes only one, or even no, pupil to the 'eye' and there are sometimes 1, 2, 3, or, rarely 4, extra 'eyes'. Some or all of these extra 'eyes' are pupilled, and they are usually duplicated on the under side. On the hind wing there may be no 'eyes' on the upper side, as in those figured,



HEDGE BROWN

TITHONUS

HEDGE BROWN

though there is more often one anal eye-spot and there may be several such spots, as there usually are on the under side.

Partial albinos occur, the colour being drab, or creamy. When the part which is usually orange is white, the variety is called *Ab. albida*, when yellow, *Ab. mincki*. A rare type exists in which the orange is unaffected, but the parts usually dark brown or black are a pale drab.

Life cycle. One generation a year, wintering as Larva. Late flying specimens, found in September, are believed to be delayed by wet summers rather than examples of a second generation.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----					Pupa-----	Butterfly	Eggs	Larva-----			

Life history. The Eggs are laid singly on the grasses and hatch in about 20 days. The Larvae eat the crown of the egg, then emerge and eat a part of the egg shell. They feed on the grass all through September and then hibernate completely until warm spring weather sets in. They are very sluggish, feeding only at night and resting by day at the base of the grass. They moult 4 times. The Pupa is attached to the grass in the same way as that of the Meadow Brown, *jurtina*, by retaining, attached to its tail, the remains of the larval skin. It lasts about 22 days.

MANIOLA TITHONUS

The Butterflies are particularly fond of bramble flowers, marjoram (*Origanum vulgare*) and wood sage, and are usually seen fluttering on the brambles in hedges, often in large numbers together. They seem to avoid the ground, except to lay their eggs on the grasses, and rarely rise to trees. Life about 21 days.

GENUS COENONYMPHA

Hübner

Two species, *pamphilus* and *tullia*

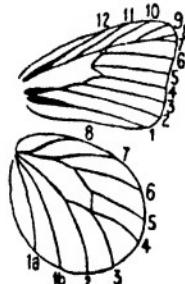
Eggs. Melon-shaped, some slightly flattened at the end.

Larva. Slug-shaped, green, fork-tailed, smooth, grass eaters.

Pupa. Suspended, green, squat.

Butterflies. Small. Antennae rather long, with an oblong club. Palpi slightly longer than the head, first 2 joints hairy. Wing structure differs from that of any of our other genera in that 3 veins are dilated.

This sketch is that of the wings of *tullia*.

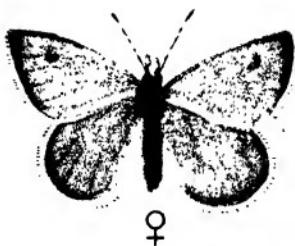




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SMALL HEATH

PAMPHILUS



SMALL HEATH

Coenonympha pamphilus

Habitat. Most of Europe and Asia and N. Africa. Here, resident throughout U.K., except the extreme north of Scotland and the Orkneys and Shetlands.

Haunts. All types of country wherever there is grass, even up mountains to 2,000 feet, and down to the sea-coast.

Description. Larva. Green, striped darker and paler. Tail-points pinkish white.

Food-plant. Grasses, chiefly those with small leaves, amongst those recorded being: annual meadow-grass, wood meadow-grass (*Poa nemoralis*), meadow fescue grass (*Festuca pratensis*), mat-grass, and crested dog's-tail.

Pupa. Green with rather darker markings: suspended from tail-hooks.

Butterfly. The sexes differ slightly, the female rarely having the very dark borders round the wings on the upper side.

Varieties. There is much minor variation, particularly on the under sides. As the different types are not local, but may be found everywhere together, they must be ranked as 'forms' rather than sub-species. Thus the 'eye' on the upper side of the fore wing may be large and clear (it is never white-pupilled) or small and faint, or even absent. An aberration with this spot present in one wing only has been found. The under side of the hind wing may be pale tawny or ashy grey, and the creamy band may be reduced to a mere spot.

SMALL HEATH

Partial albinos are fairly common. ♂♀ specimens are very rare.

Identification. The only possible confusion is with *tullia* and the difference in size should prevent this. Note also that the Small Heath, *pamphilus*, has, on under hind wing, at most, white spots, while the Large Heath, *tullia*, (except sometimes the Northern sub-species, *C.t. laidion*) has black 'eyes' often pupilled with white.

Life cycle. One generation a year, with, in the drier districts, a partial second generation. Winters as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----			Pupa-----								
				Butterflies							
and, in S. & E., some:			Eggs-----		Larva-----		Pupa-----	Butterfly			
								Eggs			
								Larva-----			

Life history. The Eggs are laid singly on the grasses and hatch in about 14 days. The Larva of the earlier brood usually moults 3 times and then winters (feeding by day in mild weather). When full fed (after the 4th moult) it spins a silk pad to a grass-stem, hangs for 4 days, and then pupates. Usually a night feeder. Pupa, suspended by tail-hooks, lasts about 26 days.

The Butterfly is one of our commonest, being found in every type of country. It is not very active.

COENONYMPHA PAMPHILUS

Its flights are slow and fluttering, usually extending to a few yards only. It also flies very low and generally only when disturbed. It will fly in sun or cloudy weather, settling, with closed wings, on grass-heads or knapweed. Life about 18-20 days.



Northern Form



Central Form



Southern Form

LARGE HEATH

TULLIA



LARGE HEATH

Coenonympha tullia

Habitat. Moist mountain meadows throughout N. and Central Europe. Here, resident, local but numerous in N. England, N. Wales, Scotland, and the Isles of Arran, Orkneys, Shetlands, and the Outer Hebrides.

Haunts. Moors, mosses, bogs, and mountains up to 2,000 feet.

Description. Larva. Green, with pale stripes. Tail-points pink and white.

Food-plant. Believed to feed only on the beaked rush (*Rhynchospora alba*), but, in captivity, feeds freely on fescue grasses.

Pupa. Green with white and darker markings. Orange tail-hooks. Suspended to a pad of silk.

Butterfly. Sexes do not differ in size. The males are almost always darker.

Varieties. There is so much variation that they have even been considered to belong to three different species. As appears from the plate, the differences are (1) in colour and (2) in the number and distinctness of the spots or 'eyes'. The three distinct races (northern, central, and southern) grade into each other to some extent and overlap at their respective marches, but they are sufficiently local, and mutually exclusive, to be reckoned as sub-species. They are:

C. t. laidion. The Northern sub-species. Pale colouring. Spots as follows: on the fore wing, 1 or 0; on the hind wing, 2 (very faint); on the under side, fore wing, 1; hind wing, 1 or

LARGE HEATH

2 (very faint). *Habitat.* Scotland, except the south, and parts of Ireland.

C. t². The typical Central sub-species. Medium colouring. Spots as follows: fore wing, 1 or 2; hind wing, 1 to 3; on the under side, fore wing, 1 or 2 (often white-pupilled); hind wing, 6 (very faint, sometimes white-pupilled, small). *Habitat.* N. England (Northumberland, Cumberland, Yorks., N. Lancs., Westmorland), S. Scotland, and Ireland.

C. t. philoxenus. The Southern sub-species. Darker colouring. Spots as follows: on the fore wing, 2 or 3; hind wing, 3 to 6; on the under side, fore wing, 2 to 4; hind wing, 6 (white-pupilled, large and distinct). *Habitat.* Westmorland, Cheshire, N. Shropshire, and N. Wales.

A few partial albinos have been found. ♂♀ very rare.

Identification. Size alone distinguishes this Northern sub-species from the Small Heath, *pamphilus*. All forms having white-pupilled eyes are easily detected.

Life cycle. One generation a year, wintering as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----					Pupa						
					Bfly						
					Eggs						
					Larva-----						

COENONYMPHA TULLIA

Life history. Eggs are laid singly on the rushes and hatch in about 15 days. Larva emerges after eating a lid in the egg. It feeds mainly at night, though reported to feed on warm days in early spring. There are 4 moults. The Pupa lasts about 23 days.

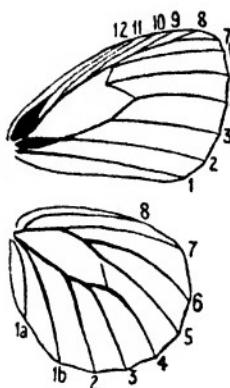
The Butterflies are lively and active, flying up and down, as it were 'dancing', among the grasses and heather of their moorland haunts. Fly swiftly when scared. Seem seldom to rest on flowers, and in dull weather settle low down on the stems of grass or heather. Life about 15-20 days.

GENUS APHANTOPUS

Wallengren

Single species, *hyperanthus*

Very similar in most respects to *Maniola*. Differs most in the form and method of laying the Eggs and in the colour and appearance of the Larvae and Pupae. Wing structure thus:





RINGLET

Aphantopus hyperanthus

Habitat. Through central and N. Europe (except the Arctic) to N. Asia and Japan. Here, resident throughout U.K., commoner in S. England and Wales. In Scotland up to Ross. Common throughout Ireland.

Haunts. Woodlands, rides, clearings, and hedgerows, particularly where there are brambles.

Description. Larva. Short, fat, and slug-shaped. Pale ochre with pink streaks, brown below; covered with tiny brown hairs.

Food-plant. Various grasses, mainly those growing among trees.

The following are recorded: couch-grass, annual meadow-grass, cock's-foot, false brome-grass, millet-grass (*Milium effusum*), and tufted hair-grass.

Pupa. Fat, pinkish ochre with brown marks. Tail-hooks replaced with straight spines. Lying unattached on the ground at base of grass, in a loose cocoon of a few silk threads.

Butterfly. The male is slightly smaller, darker, almost black, and has a patch of scent scales covering the base of the fore wing. The normal equipment of 'eyes' is as in plate.

Varieties. There is much variety in the visibility of the 'eyes' and some in their number. They are usually, on upper side, 2 or 3 on each wing; on under side, fore wing, 1-3, hind wing, 5. Their visibility depends on the darkness of the ground colour, and the presence or absence of the white pupils, the black dots, and the yellow surrounds. The white is usually present only on the under sides. These variations have produced the following names:



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RINGLET

HYPERANTHUS

RINGLET

Ab. *lanceolata*, Shipp., the 'eyes' drawn out,
Chinese fashion, thus:

Ab. *obsoleta*, Tutt, no spots at all.

Ab. *caeca*, Fuchs, white dots only.

Ab. *arete*, Mill, white and yellow, no black.

♂ ♀ very rare. Partial albinism rare.

Identification. The upper side of the male, Meadow Brown, *jurtina* is much like this species. The under sides are unmistakable.

Life cycle. One generation a year, wintering as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa Butrfly Eggs Larva						

Life history. The Eggs, like those of the Marbled White, *galathea*, are scattered promiscuously in the grass, and hatch in about 18 days. The Larva feeds at night only, resting during the day along the grass-stems. There is no true hibernation, feeding continuing in warm weather through the winter. If alarmed by any movement, they drop to the ground, curl up, and lie 'doggo' for a minute or so before taking up their station along the grass. They are thus best caught by sweeping the grass with a net at night. They spin a few threads as a sort of cocoon when about to pupate, and lie down at the base of the grasses. The Pupa, unattached, lasts about 14 days.

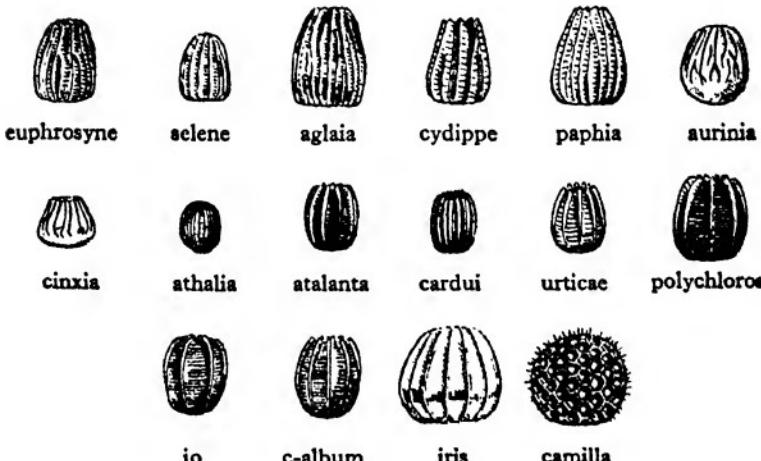
APHANTOPUS HYPERANTHUS

The **Butterfly** is locally very numerous in and about woods, and very fond of feeding on bramble flowers. It flutters slowly among the long grasses in damp places, seeking shade, and flying even in rain, if warm. It is fearless, or unobservant, of Man and easy to catch. Life about 21 days.

FAMILY NYMPHALIDAE. THE FRITILLARIES AND OTHER ARISTOCRATS

This family contains two groups which differ much in general appearance. The Fritillaries are orange on the upper sides marked with black, while the under sides have patterns often marked with silver. The others include some of the most brilliant of our Butterflies.

The **Eggs** are mostly acorn-shaped (without the



Scale \times 5.

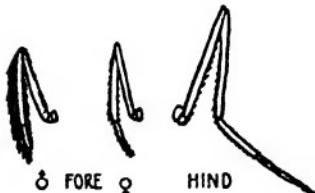
THE FRITILLARIES

cup) and decorated with longitudinal flanges or keels, often large and prominent. In colour, those of the Fritillaries are yellow or ochreous, and of the others generally a bright green. Exceptionally, the Eggs of *aglaia* and *iris* are marked with purple, those of *polychlorus* turn from yellow to red-brown, and those of *antiopa* are orange. The White Admiral, *camilla*, differs from all the others in laying olive green and almost spherical eggs, pitted with hexagonal dimples and covered with upstanding spines.

The **Larvae** are generally tubular, with little diminution towards the ends, small heads, and long, spiky, thornlike spines armed with bristles. Of our species, the Purple Emperor, *iris*, alone has a very different Larva, without spines but with two horns.

The **Pupae** (again excepting those of *iris*) are angular, with sharp projections, which are supposed to protect them from injury if swung against anything by the wind. They often have spots of silver or gold, whence the general name of 'chrysalis' (= golden) applied to all Butterfly Pupae. They all hang from tail hooks without silk girdles.

The **Butterflies** have smooth or hairy eyes, and antennae which vary in the different genera. The palpi are clearly articulated, the last joint being pointed. Both sexes have only 4 walking legs, the fore legs being rudimentary or atrophied and held up against the bodies. Those of the males have but 2



NYMPHALIDAE

foot-joints and no claws: those of the females have more joints and 4 minute points, one from each joint.

The wings, except those of the Fritillaries, are often pointed or sharply indented. All our genera have two anal veins on the hind wings. The discal cell of the hind wing is open in all except *Argynnus*. All have precostal veins on the hind wings except *Vanessa*. The fore wings have 12 veins, none of which are dilated. Most of the family have only one generation a year. It includes all our species which winter as Butterflies except the Brimstone, *rhamni*, and there is great variety of larval food-plants and habits. Their flight is swift and powerful.

GENUS ARGYNNIS Fabricius

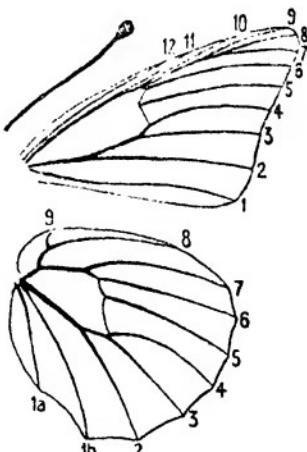
Five species, *euphrosyne*, *seleene*, *aglaia*, *cydippe*, *paphia* (and *lathonia*, see Appendix)

Eggs. As described for Family, laid singly.

Larva. Cylindrical and spiny; feeding on violets.

Pupa. The larger the more covered with spines and, usually, the more metal-spotted.

The Butterflies have smooth eyes, antennae long, thin, and with short oval clubs. Palpi longer than head, with first 2 joints hairy, middle joint much swollen, 3rd joint bare and pointed. The males are more brilliant than the females. All have silver on under hind wings. Wing structure: discal cell closed on both wings, but with very faint cross-bars. The sketch is that of *paphia*, the type of the genus.





PEARL-BORDERED FRITILLARY

Argynnис euphrosyne

Habitat. All Europe (except Portugal, Sicily, Corsica, and Sardinia), also Armenia, the Altai and Amur. Here, resident throughout Britain, scarcer northwards, and not in the Isles or in Ireland.

Haunts. Clearings in large woods, particularly where, some few years after a cut, violets and primroses have grown up.

Description. Larva. Black, white spotted, with black-pointed spines (sometimes yellow), the front pair pointing forwards.

Food-plant. The dog violet. The Larva will also sometimes feed on primroses and the garden pansy.

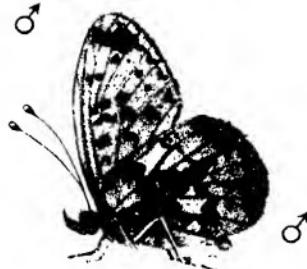
Pupa. Grey brown, much curved, with no metallic spots but rusty points along the back. Hanging by tail-hooks to stem or leaf of violets.

Butterfly. The female is slightly yellower (less orange) above than the male. In both sexes, on the under hind wing, there are 7 border 'pearls' and, in addition, 2 silver spots only: one outside the central ('eyed') spot, and one between it and the body.

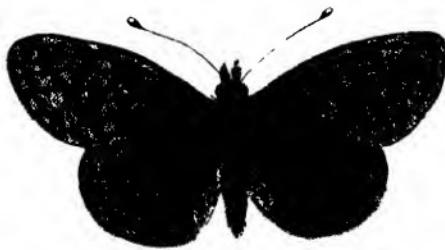
Varieties. These are many and very various, but all mere aberrations not seeming to have any local persistence. They chiefly consist of more or less blurring together of the black markings of the upper side, particularly in the middle of the fore wing. Some also show a gathering of all the black to the hind wing, leaving the fore wing only a few black dots on its fulvous orange surface. A dull lead colour has



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PEARL-BORDERED FRITILLARY

EUPHROSYNE

PEARL-BORDERED FRITILLARY

been found replacing the black. Partial albinos, with white spots or areas, are recorded.

Identification. Under hind wing: 7 border 'pearls' and 2 other silver spots. Contrast with *A. selene*: 7 border 'pearls' and 6 or 7 other silver spots, around the central 'eyed' spot. *Eu. aurinia* and *M. cinxia* and *M. athalia*: have no pearl or silver.

Life cycle. Here, one generation a year, hibernating as Larva. In very warm summers some few individuals go through a second generation. This is the rule in warmer climates.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva				Pupa B'fly Eggs	Larva						
and, rarely, a few:							Pupa B'fly Eggs	Larva			

Life history. Eggs are laid, singly, on the leaves of the dog violet and hatch in about 10-15 days. The Larvae feed by day, leaving the plant at night, and moult 3 times before the end of July, when, regardless of temperature, they stop feeding and hibernate, on the under side of a withered leaf of the food-plant, until the end of March or until sunny warm weather sets in. They moult a 4th time and hang from a pad of silk spun from a stem to pupate. The Pupa, hanging from tail-hooks, lasts only 9 days.

The Butterflies spend the greater part of their

ARGYNNIS EUPHROSYNE

time on the wing. Their flight is swift and gliding, beating backwards and forwards in open glades and rides of woodland. Towards evening they bask, with open wings, in the sunlight, resting on the ground or on low herbage and, particularly, on the flowers of the bugle. At night they settle under leaves or on grass or rush flower-heads. Life about a month.



SMALL PEARL-BORDERED FRITILLARY *SELENE*



SMALL PEARL-BORDERED FRITILLARY

Argynnis selene

Habitat. Most of Europe (except Andalusia, the Mediterranean Islands, and Greece) and N. and E. Asia to Corea. Here, throughout Britain. More local than *euphrosyne* in England, commoner in Scotland. Once recorded (a stray) in Ireland.

Haunts. Woodlands (as *A. eu.*), but prefers damp woods and is also found on marshy ground and in damp road-side hollows away from woods. Also on moist sea-cliffs.

Description. Larva. Brown with small light spots; spines ochre, with black bristles. The front spikes are larger, pointing forward, hornlike.

Food-plant. Dog violet.

Pupa. Brown with black markings, including a V on the upper back, pointing towards the head. There are several minute metallic dots on the head and along the back. Suspended as *A. eu.* Lasts about 14 days.

Butterfly. Very slightly smaller than *A. eu.* Though usually the markings on the upper side are narrower, the under sides alone distinguish the two species. The male is slightly the smaller and the marginal spots of the females are often paler.

Varieties. These are very similar in character to those of the last species. The tendency to additional blackness is even more marked. Frohawk illustrates a specimen of a 'deep purple brown' all over except for a row of fulvous spots round the margin.

Identification. Under side of the hind wing: 7

SMALL PEARL-BORDERED FRITILLARY
'pearls' on the border and 6 or 7 other silver spots surrounding the central 'eyed' spot. Contrast with:

A. euphrosyne: 7 'pearls' plus 2 silver spots.

All other small Fritillaries (*Eu. aurinia*, *M. cinxia*, and *M. athalia*) have no silver at all.

Life cycle. Here, 1 generation a year, hibernating as Larva. On the Continent usually 2. Here, although the flight is nearly a month later than that of *euphrosyne*, the occasional partial second generation is much less rare than in the case of that species.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa						
					Bufly						

Eggs

Larva

Pupa

Bufly

Eggs

Larva

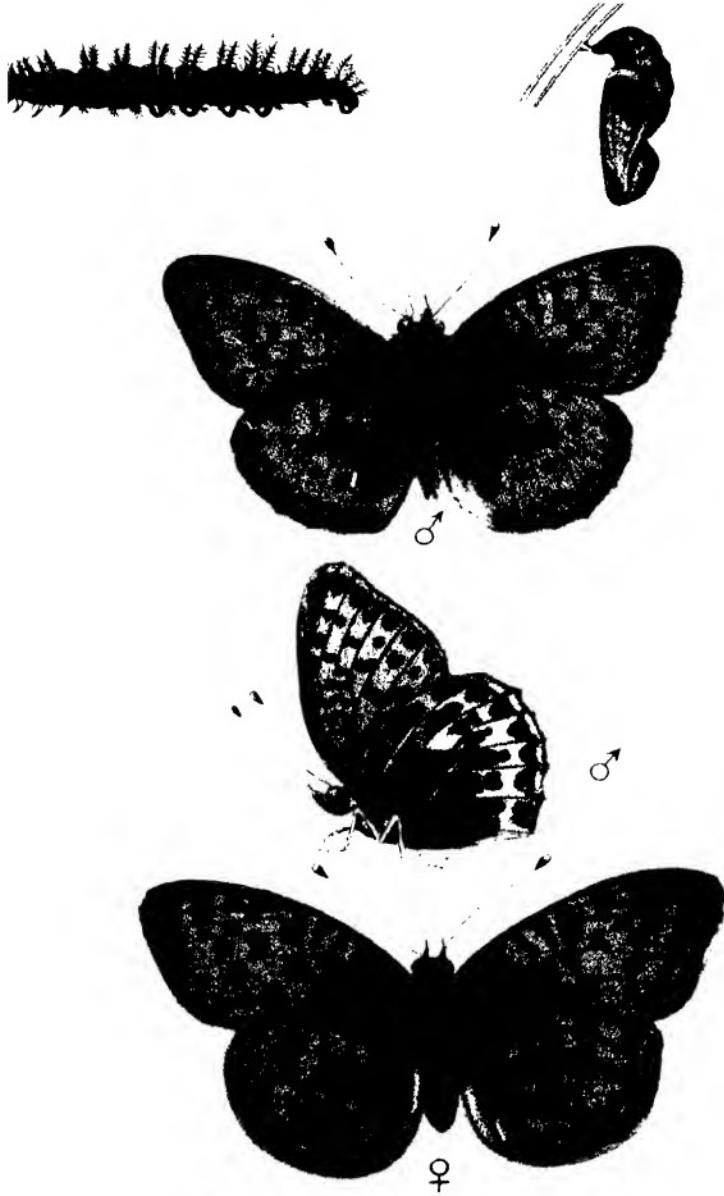
and often in hot years
a few:

The first flight usually overlaps that of *euphrosyne*.

Life history. Eggs are laid singly, usually on the under side of the violet leaves, and hatch in about 10-12 days. Larvae usually remain under the leaves, not enjoying the sunlight as do those of *A. eu*. Until fully grown, feed only on the young leaves. Hibernate, after the 3rd moult (about end August) in the twisted part of a withered leaf, where they sleep till spring with cover and a background admirably matching their colour. Feed by day, in sun or shade. Moult 4 times. Pupa, suspended as *euphrosyne*, lasts about 14 days.

ARGYNNIS SELENE

The **Butterflies**. In flight and manners similar to *euphrosyne*, with which they are often seen in company. They have, however, (as above said) a somewhat more restricted range in woodland owing to their need of moisture, and a somewhat wider range on country other than woodland. Rest much on grass and rush-heads (for example, on field woodrush) with which their under colouring gives excellent camouflage. Life about 4 weeks.



DARK GREEN FRITILLARY

AGLAIA



DARK GREEN FRITILLARY

Argynnis aglaja

Habitat. Almost all Europe and Asia, except the Canaries, Asia Minor, Syria, and Iran. Here, resident, local but common where found, in most counties of England, Wales, and on the Scottish mainland and Skye. In Ireland mainly coastal.

Haunts. Particularly coastal cliffs, sand-hills, heaths, commons, and open forest land. Not in woods but sometimes on rough ground outside.

Description. Larva. Reddish-black with white speckles and orange side-spots. There are complex black spines (first pair simple and small).

Food-plant. Dog violet and other species of *Viola*. Reported, as captive, to prefer heath milkwort.

Pupa. Bent almost into a ?. 'Varnished' yellow-brown, marked and clouded with purple and black, as if toasted. No metallic spots. Hangs by tail-hooks to stem, sometimes under a tent of silk-bound leaves.

Butterfly. The male is slightly smaller and has black scent-scales on veins 1 and 2 of the fore wing (p. 119). The females are without these and are paler and yellower in colour and usually more heavily black-marked. On the under side of the fore wing is a row of silver spots along the edge near the tip (sometimes 2 more inside them) and the under side of the hind wing is dark green with some 20 squarish silver spots, a large yellow spot near the centre and an unbroken yellow band inside the outer border of silver spots, which are edged on the inside with green.

Varieties. As in other Fritillaries, many odd aberrations are found, usually with additional blacking of

DARK GREEN FRITILLARY

the upper surface; in extreme cases, leaving only a few spots of orange on the wings. One named variety is recorded only from Britain, viz:

Ab. *charlotta*, unusually large silver spots on the under hind wing, including 3 large blotches at the base.

Identification. Under side. Fore wing: silver spots. Hind wing: dark green, no small red eyes between the two main bordering rows of silver spots. Contrast with:

A. cydippe, fore wing: silver spots absent, or few and faint. Hind wing: orange, clouded reddish, no green; between outer and inner row of silver spots, an irregular row of dark red eyes, pupilled silver.

A. paphia, hind wing: green, silver washed on, in stripes, not spots.

Life cycle. One generation a year, hibernating as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----				Pupa							
					Buttly Eggs						Larva-----

Life history. Eggs are laid singly on leaves or stems of the food-plant and hatch in about 17 days. The Larvae move very quickly and feed rapidly, by day, preferably in full sunlight. They hibernate as soon as hatched and do not feed or move again until the

ARGYNNIS AGLAIA

end of March. There are 5 moults, and before pupating they make a covering tent by fastening a few leaves together with silk and then, on leaf or stem, spin the pad from which they hang. This is sometimes on grass or plants other than the food-plant. The Pupa lasts about 4 weeks.

The Butterflies are among the swiftest, most active, and masterly fliers in this country, skimming and soaring to breast the wind in exposed places. They are very fond of the purple field-thistle and are easiest caught, if carefully stalked, while basking and feeding on these or on the lower composite flowers. They will sometimes take cover from rain under trees and, probably, rest among the leaves of tall trees. They are also found basking on grass or even on bare sand. Life about 6 weeks.



HIGH BROWN FRITILLARY

Argynnис cydippe

Habitat. All Europe (except the Arctic), also Asia Minor, Armenia, the Altai, and Amur. Here, resident and rather local. Commoner than *aglaia* in most of England and Wales, becoming rarer northwards and absent north of Cumberland. Not in Ireland (a few strays in 1887).

Haunts. The warmer woodlands and forests.

Description. Larva. Two varieties, (1) ochre marked with black dashes outlined white, spines and bristles pale red, and (2) dark brown, spines red-brown.

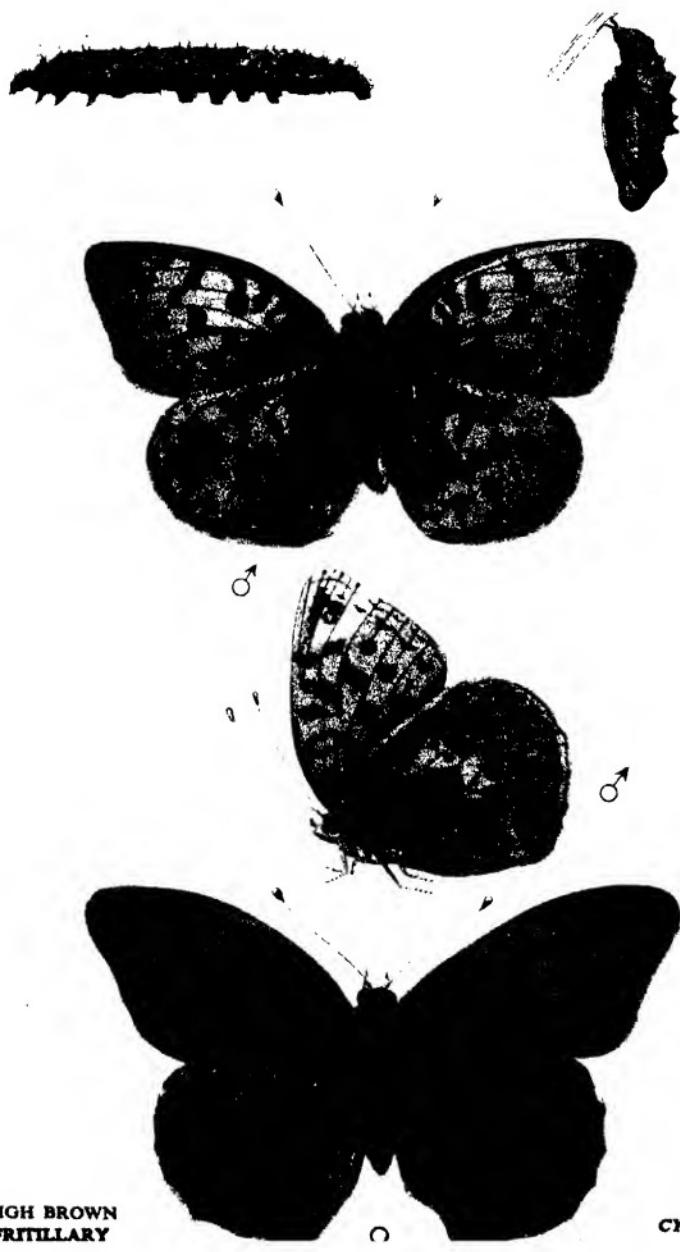
Food-plant. Dog violet and, possibly, the sweet violet.

Pupa. Coffee-coloured, marked darker. Two rows of metallic points down the back. Hung in a tent of leaves spun together.

Butterfly. The males are a good deal smaller than the females and are a brighter orange with black scent-scales along veins 2 and 3 of the fore wing (lowest branches of cubital). Females paler and yellower; their under sides more richly marked, the silver spots larger and those on the fore wing more developed.

Both sexes have, sometimes, 2 or 3 faint silver spots near apex of under fore wing, and, on the under hind wing, always, a row of small, blurred, red eyes, silver pupilled, between the two main outer rows of silver spots.

Varieties. There are many variations, mostly in unusual blackenings of the upper surfaces of the wings. These may, in extreme cases, be all black except for their edges. There is also a variety in which



HIGH BROWN FRITILLARY

all the silver spots on the under hind wing are run together into one large area. In a very rare albino variety all black is replaced by pearly grey. One named variety:

Ab. *cleodoxa* has no silver, but ochreous colour instead. Common in S. Europe, but very rare here.

Identification. Under side. Fore wing: usually no silver, more often in female. Hind wing: ochre and red-brown. An irregular row of small red 'eyes' or blurred spots, pupilled silver, between the two main outer rows of silver spots. Contrast with:

A. aglaia, fore wing: definite silver spots. Hind wing: dark green; no such red 'eyes'.

A. paphia, hind wing: apple green, the silver washed on, in stripes across the wing.

Life cycle. One generation a year, wintering as Eggs. In this, they stand alone among our species except for some of the Blues, Hairstreaks, and Skippers.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----		Pupa	Buflly Eggs-----					

Life history. Eggs are laid singly on the food-plant, mainly on stems, and do not hatch until the spring, though it is said that the Larvae are fully

ARGYNNIS CYDIPPE

developed in them before the winter begins. **Larvae** feed by daylight, especially in sunlight. They are very active quick movers. There are 5 moults. Before pupating they spin some leaves of the violets together to make a tent and then hang up to a pad of silk spun from a stem under its shelter. **Pupae** hang from this pad of silk, by tail-hooks, and last for some 25 days.

The **Butterflies** are sun-loving, very active and competent fliers, skimming to and fro in the wood rides and clearings in search of the flowers they most enjoy—thistles and brambles. When a cloud passes they fly up to the trees, where, also, they spend the night. Life about 4 weeks.



SILVER-WASHED FRITILLARY

Argynnис paphia

Habitat. Most of Europe and Asia to China and Japan. Here, resident in most large woods of England and Wales, becoming rarer northwards. Rare in Scotland, though recorded in Clyde, Dee, and Tay districts. Common, though local, in Ireland up to Armagh. There are years of abundance (e.g. 1924) but generally the species is less common than in the last century.

Haunts. Large woods, but also commons and lanes where there are many brambles and thistles.

Description. Larva. Purple-brown, streaked buff and black, with complex buff spikes, the fore pair forming horns.

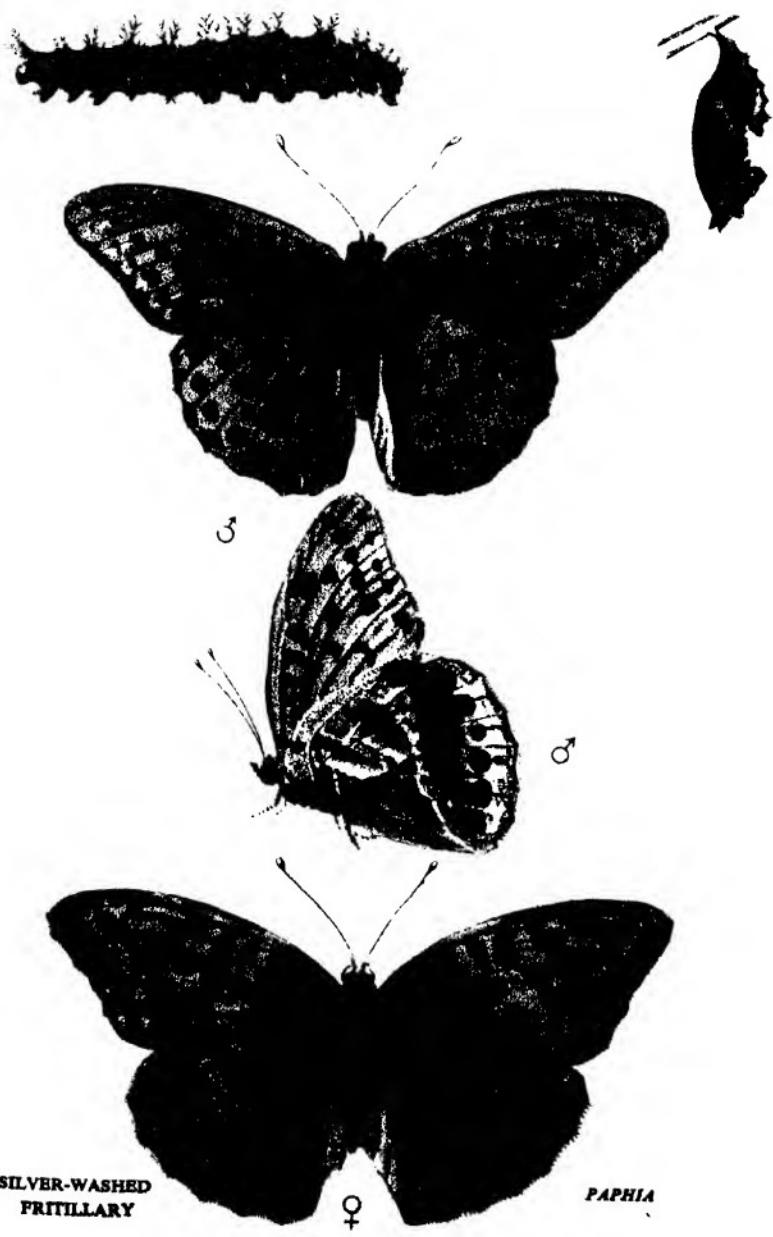
Food-plant. Dog-violet. In captivity, other violets.

Pupa. Two horns on head. Pale buff, patterned in brown. Has 10 golden points and simulates a dewy dead leaf. Hung up by tail-hooks.

Butterfly. The sexes differ slightly in size and markedly on the upper sides, the males being brighter and having black scent-scales along some of the veins. There are two distinct forms of the females: (1) the common form here depicted, of a paler fulvous ground-colour than the males, and (2) the form called *valezina* (see below). On the under sides the silver is washed on, in stripes across the wing, as well as being present in spots.

Varieties. The second, much rarer, form of the female:

Ab. ♀ *valezina* differs in colour on both sides, the fulvous shade being replaced by a pale greenish-



SILVER-WASHED
FRITILLARY

PAPHIA

SILVER-WASHED FRITILLARY

yellow. This form, rare here, is the commoner in the far east. It never appears in the male.

Apart from this form, there are many abnormalities known. In some the black markings are much exaggerated, sometimes clouding all the central area of the wings (*Ab. nigrizina*, Froh.). There are also partial albinos, commonly females, in which white spots appear, and there are females in which spots of the *valezina* colour are present. Very rarely ♂♀ specimens are found in which the ♀ side may be either normal or *valezina*.

Identification. Our only Fritillary in which the silver is washed on, in stripes: in all others it is in well-defined round or moon-shaped spots.

Life cycle. One generation a year, wintering as Larvae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa						

Pupa
 Butterfly
 Eggs
 Larva

Life history. Eggs are laid singly in the crevices of tree-trunks (chiefly pines and oaks) over ground on which the dog-violets are growing. They hatch in about 15 days. The Larvae eat a small exit hole in the egg and then, without further food, go to a cranny in the bark nearby and hibernate until the end of March. They can be alarmed during the winter and, if so, form themselves into a ring and roll to the

ARGYNNIS PAPHIA

ground, where, after lying 'doggo' for some minutes, they unroll and seek for another crevice in which to rest. In March they crawl to the ground (if not already there) and seek out the food-plant. They crawl and feed quickly, by day, and are particularly active in sunlight. The **Pupae** hang by tail-hooks on or near the food-plant and last about 18 days.

The **Butterflies** are a woodland species, sleeping at night and resting by day, or sheltering from the rain on the leaves of trees (preferably oaks) from which, where abundant, their descent when the sun comes out, has been likened to a fall of leaves. They glide and flutter over the flowers of brambles, of which they are very fond. They are also found away from woods, even sunning themselves on the walls of country towns, but are rarely seen in gardens or on arable land. Life about 5 weeks.

GENUS EUPHYDRYAS Scudder

One species, *aurinia*

Eggs. Acorn-shaped, fluted with branching ribs, yellow. All laid in a mass.

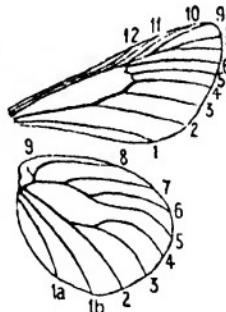
Larva. Covered with complex spines: gregarious. Feeds off devil's bit scabious. Five moults.

Pupa. Has slight points on the head and no metallic spots. Hangs from tail-hooks.

Butterfly. Has smooth eyes, antennae long, thin, with pear-shaped clubs. Wing shape, long and straight front edge to fore wing. Structure as shown. Note: fore wing, cell closed with very fine cross-bar; hind wing, cell open.

They frequent marshy ground and have a distinctive basking position. In colouring they have no silver.

Generally there is much resemblance to *Melitea*.





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♀

MARSH FRITILLARY

AURINIA



MARSH FRITILLARY

Euphydryas aurinia

Habitat. Over most of Europe and Asia to Corea. Here, resident, local and widely spread in England, Wales, and Ireland. Not so common in Scotland, but present up to Moray and Argyll and in Mull. Subject to local disappearances, perhaps due to ichneumon flies, from which it suffers greatly.

Haunts. Marshy ground, damp meadows, and some chalk hill-tops, where the food-plant is common.

Description. Larva. Tapering to both ends, black, with white speckled stripe along sides and brown underneath. Short complex spines longest at the middle.

Food-plant. Devil's bit. The Larvae are also reported as eating plantains, foxglove, wood-sage and, in captivity, honey-suckle.

Pupa. Pale yellow and lilac, marked black, hangs by tail-hooks.

Butterfly. Both sexes vary much in size, although the males are usually the smaller. The male's fore wings are more pointed. Note a *single* row of black spots round the under side of hind wing, no spots round under side of fore wing.

Varieties. Great local variation. Speaking generally, the yellower forms come from the SW. districts, the blacker from Scotland, N. England, and Ireland, and the more usual (= redder) forms from the S. and E. There are many named aberrations, such as: *Ab. scotia*. Black strongly marked, other colours dull. *Ab. praecincta*. Black base large, other colours bright.

Identification. Under side: hind wing, one row of black spots; fore wing, no black dots. Contrast with

MARSH FRITILLARY

other species having no silver on underwings: *Melitaea cinxia* has several rows of black dots on hind wing. *M. athalia* has several rows of black lines, no dots. *Hamearis lucina* has a row of black dots round the fore wing also, and is very much smaller.

Life cycle. One generation a year, hibernating as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----				Pupa Buflly Eggs							
					Larva-----						

Life history. The Eggs, some 500 in number, are laid in one mass, piled up towards the centre, on a leaf of the scabious. They hatch in about 20 days. The Larvae live gregariously. On hatching, they spin a web over the food-plant and eat beneath it. When it is eaten they go away together and spin another such web and feed there, by day and in sunlight. After the 3rd moult, about end of August, they form a compact winter nest by rolling up some leaves of the scabious and spinning them into a ball, leaving one or more holes as doorways. For some days after this they come out, together, for an hour or two at midday to feed, returning to the nest to rest. After a week or so they remain in the nest until, in early spring, the scabious grows fresh leaves. These they seek, eating them as they emerge from the ground, and returning to the nest to sleep. They moult 5

EUPHYDRYAS AURINIA

times. They have been reported as so numerous as to darken the whole ground. When ready to pupate, each Larva forms a tent by gathering leaves or grasses together to a point which is fastened with silk and then hangs from the point of junction, under the tent's protection. Pupae last about 15 days.

The **Butterflies** are somewhat sluggish and, when basking in the sun, lay the fore wings back over the hind so as almost to cover them, particularly in hot close weather. The male is the more active of the two sexes, flying about its own field, and resting much upon yellow composite flowers such as hawkbit, cat's ear, and dandelion. The female is more sluggish, usually sitting upon the scabious or on grass near to it. They rarely leave their own field, except when, if overcrowded, seeking a new home. Then they are met singly, as it were migrating, along lanes or woodland tracks. Life about 1 month.

GENUS MELITAEA Fabricius

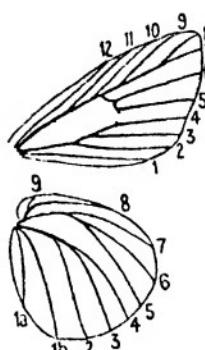
Two species, *cinxia* and *athalia*

Eggs. Pear- or hen's egg-shaped, sometimes flattened at either end and ribbed lengthwise. All laid in one mass.

Larva. Covered with complex spines. Gregarious. Feeding on low plants. Six moults.

Pupa. Hanging. No metallic spots.

Butterfly. No silver markings. Antennae long, thin, with pear-shaped clubs. Eyes smooth. Wing shape: less straight edged than *Euphydryas*. Structure: fore wing, cell open between veins 4 and 5; hind wing, cell open.





GLANVILLE FRITILLARY

CINXIA



GLANVILLE FRITILLARY

Melitaea cinxia

Habitat. Most of Europe, except the Arctic, Asia Minor, and Siberia. Here, resident, only in the SE. of the Isle of Wight.

Haunts. Steep untilled slopes.

Description. **Larva.** Black, dotted round the body with white. Head and legs, red. Body covered with complex spines of dull green with black points.

Food-plant. Sea plantain and ribwort plantain.

Pupa. Hung from a silk pad by tail-hooks. No metallic spots, but yellow knobs and black markings.

Butterfly. The males are much smaller than the females and are darker, with heavier markings and fore wings more rounded. On the fore wings appear marks reading OB BO. Under side of hind wing has several rows of black dots.

Varieties. Some specimens show an absence of the black marks about the middle of the fore wing, and the dots on the under hind wing may be lacking or enlarged into tadpole shapes.

Identification. OB BO above mentioned, and several rows of black dots on under side of hind wing. Contrast with the other small fritillaries which have no silver on the under wing, thus:

M. athalia. O8 8O on upper fore wing, no dots on under wing, only lines.

GLANVILLE FRITILLARY

H. lucina is much smaller, has one row of dots on under side of both wings.

Eu. aurinia has one row only of dots on under hind wing and none on fore.

Life cycle. One generation a year, hibernating as Larvae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----			Pupa Butterfly	Eggs	Larva-----						

Life history. The Eggs are laid all in a batch, of 200–300, on the plantain leaves, and hatch in about 20 days. The Larvae are gregarious all their lives and live under a silk web until after hibernation. They are active and feed only in the sun. When about to hibernate, they spin a compact nest of silk, with internal partitions and an entrance hole underneath. This nest is sustained upon leaves or grass stems. After coming out in the spring they dispense with the silk net coverings and feed in the open, huddling together, immovable, when the sun is covered. When about to pupate, after the 6th moult, the Larvae (sometimes several together) select the stems of plants or the under sides of large stones and hang themselves from them. The Pupae last about 20 days.

The Butterflies fly slowly (except when alarmed) and gracefully, gliding from flower to flower. They

MELITAEA CINXIA

choose chiefly yellow flowers, of which the following is a list of those reported: bird's-foot trefoil, horse-shoe vetch, rest-harrow, hawkweed, woodspurge, crosswort and, particularly, kidney vetch. The males will (unusually) bask on flowers with the fore wings laid back over the hind. The rarity of the species is probably due to its needing a greater amount of sunlight than our climate can provide. Life about 25 days.



HEATH FRITILLARY

Melitaea athalia

Habitat. Wooded districts over most of Europe and Asia to Japan. Here, resident, very local and increasingly restricted to a few southern English counties and near Killarney in Ireland.

Haunts. Woodlands, and heaths, particularly where recently cleared of timber and where the undergrowth has been cleared 2 or 3 years before.

Description. Larva. Black with olive hind legs and under parts, the whole sprinkled over with white spots and dull yellow tubercles all bearing black hairs. Head bronzed.

Food-plant. Common cow-wheat, also found feeding on foxglove, wood sage, and plantain.

Pupa. White, checkered with black and dotted with orange knobs.

Butterfly. Generally very like the Glanville Fritillary, *cinxia*. The female is rather larger than the male and is usually yellower and less heavily marked with black. In both sexes the markings on the fore wings read O8 8O and on the under side of the hind wings there are no black dots, but merely lines.

Varieties. As in the last two species, these consist mainly in an absence of black markings in the centre of the fore wings and an added blackness of the rest of the wing surface. An extreme example of this was taken in 1803 and called Ab. *pryonia* Hübner (= *eos* Haworth), another in 1907 by Frohawk.

Identification. No silver and no black dots on the under side. This suffices to contrast it with any of the similar species.



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HEATH FRITILLARY *ATHALIA*

HEATH FRITILLARY

Life cycle. One generation a year, hibernating as a Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva					Pupa Butterfly Eggs						Larva

Life history. The **Eggs** (some 300 in number) are laid in several (e.g. 3) batches, usually under the leaves of the cow-wheat, and they hatch in about 16 days. The **Larvae** are gregarious throughout life. They stay among the eggshells for some days after hatching, and then spin a web under the leaves and begin to feed on the skin of the leaf. They go out in small parties to feed and come back to the others after feeding. They hibernate after the 3rd moult under a silken web or inside a curled dead leaf. After hibernation is over, they often shelter under dead leaves, coming out to feed only in sunlight. These Larvae, and also those of the two preceding species, have a habit of all throwing up their heads in unison when alarmed. It is thought that this gesture frightens some of their enemies, or at least reminds them of the unpleasant prickly nature of the Larvae. Moult 6 times. The **Pupa**, hanging from tail-hooks, lasts about 15 days.

The **Butterflies** are somewhat sluggish (more so than the Small Pearl-bordered Fritillary, *selene*) with a low and graceful flight, skimming from flower

MELITAEA ATHALIA

to flower. They frequent the flowers of the cow-wheat, bugle, ragged robin, bell heather, and thistles. They often sit with the fore wings laid back between the hind, and rest, by night or in rain, upon grasses or on the food-plant. When taken in a net, they have been observed to lie 'doggo', feigning death. Their life span is about 25 days.

GENUS VANESSA

Fabricius

Two species, *atalanta* and
cardui

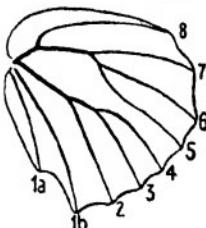
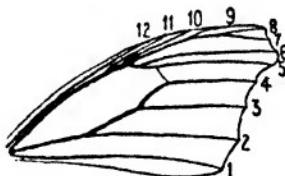
Both species are southerners, here as immigrants only, dying off in winter.

Eggs as described for Family. Laid singly.

Larva. Tubular, with complex spines; solitary.

Pupa. Angular, heads 2-pointed, metallic spotted.

Butterfly. Antennae long, with long pear-shaped clubs ending in a sharp point. Palpi, fairly long, outstretched, hairy. Eyes, hairy. Wing shape, slightly indented. Wing structure: fore wing, cell closed by short, faintly visible cross-bar between Nos. 5 and 4. Hind wing, cell open, no precostal vein.





RED ADMIRAL

Vanessa atalanta

Habitat. Europe, except the Arctic, Asia Minor, and N. Africa. The Mediterranean basin is its headquarters in the old world, and thence it migrates yearly to cover the whole of the above area, where it breeds until killed off by cold weather. It has even extended to Iceland. It is also found in N. America, where also it is a migrant. Here, an annual immigrant in the spring, extending to all parts of the British Isles, in numbers which differ greatly in different years. There is some evidence of a returning southwards migration in the autumn.

Haunts. Particularly flower gardens.

Description. Larva. Very variable in general colour from black, with faint markings, to a pale greenish grey. There is red round the spines (which may be black or yellow) and a set of lemon yellow marks along the side. On the last segment is a pale conical wart. Head bronzed and bristly. The spines are in 7 rows and complex. The whole body is covered with white dots bearing hairs also white.

Food-plant. Stinging nettles. Also reported on pellitory-of-the-wall and hops (*Humulus*).

Pupa. Pale buff with a powdery bloom and patches of gold; is suspended.

Butterfly. The male is usually smaller. There is some normal variation in the colour of the red parts in both sexes. This may be anything from carmine to orange. The males usually have the hind wings less round and the red bands upon them narrower. The small white dot on the red band across the fore wing is unusual, but occurs in both sexes equally in about 1 out of 6 specimens.

Varieties other than the above, are very rare. The



RED ADMIRAL

ATALANTA

RED ADMIRAL

following are on record: (1) no black on the hind wing red band; (2) albinisms, with white replacing red, and (3) black bar or bars across the fore wing red band.

Life cycle. In S. Europe they breed continuously through the year. Here they arrive as immigrants in the spring and breed through the summer and early autumn. When the cold weather comes, they die out whatever their stage of development. Exceptionally, a few (females only?) hibernate as Butterflies in the warmest parts of the country.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Hibernating		Butterfly.		Butterfly		Immigrant..					
				Eggs							
				Larva							
				Pupa		Butterfly--.					
						Eggs-----.					
						Larva---.					
						Pupa--.					
						But.					
						Butterfly----					
and, in warm districts, a very few:											

Thus Butterflies appear in every month, but rarely from October to May

Life history. **Eggs** are laid singly on the young leaves and shoots of the nettles and hatch in about 7 days. **Larvae** are not gregarious, but each lives in its own leaf. It eats its way out of the egg, leaving the rest of the eggshell, and spins together the edges of the leaf to form a shelter, within which it feeds. Throughout its life it feeds within shelters so made. Four moults. The **Pupa** is hung from tail-hooks to a pad of silk under a leaf stem and lasts about 17 days.



PAINTED LADY

Vanessa cardui

Habitat. Almost the whole world, Europe, Asia, Africa, America, and even Java and Australia. Its headquarters for these parts are in N. Africa, whence it spreads by emigration, sometimes in vast hordes, reaching these islands, and sometimes even extending to Iceland. Here, very irregular and uncertain, it is found all over the United Kingdom. Some come every year, but there are great invasion years (e.g. 1879, 1903, remarkable as very wet seasons).

Haunts. Almost all kinds of country, particularly clover fields and waste places, hill-sides, lanes, and even hill-tops. Seeks hot dry spots where there are thistles.

Description. Larva. Black with spines yellow or yellow and black. The lemon marks along the sides are longer than those of *atalanta*. Underneath red-brown. There is a double stripe of yellow dots along the back.

Food-plant. Thistles: field-, ground-, musk-, and spear-. Also, sometimes, found on common mallow, viper's bugloss, burdock, and stinging nettles.

Pupa. Suspended in a leaf tent, is usually pinkish grey with purple-brown wings and gold and silver marks.

Butterfly. The sexes are similar except in size and in the shape of the wings. There is much normal variation in the orange colouring of both sexes, which varies from salmon-pink to reddish-brown.

Varieties. Striking varieties are very rare. The following are on record: (1) lacking all black marking in the centre of the wings and with fewer white dots; (2) increase of all black markings; (3) no white dots on fore wings; (4) one extra white spot, making 6, placed as in *atalanta*; (5) 2 extra white spots, making

PAINTED LADY

7, placed as in *atalanta* when the white dot in the red is there.

Life cycle. Here only immigrants in spring and autumn, breeding until killed off by cold weather. No survivors through the winter.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
				Immigrant Butterfly	Eggs	Pupa	Immig. Bfly.				
				Larva		Butterfly	Eggs	Larva-----	Pupa---	Bfly.	

and rarely a few:

In 1938 some were seen in March!

Life history. Eggs are laid singly on the upper sides of the thistle leaves and hatch in about 7 days. The Larva is solitary, behaving much as does that of the Red Admiral. It eats its way out of the egg and then crawls to the under side of the leaf, where it spins a covering layer of silk over itself and begins to feed on the under part of the leaf, leaving the upper skin and the harder spines. As each leaf is eaten, it climbs up to a higher leaf. Without timidity, it will go on feeding while touched. After the 3rd moult it ceases to spin a covering until after the 4th moult, when, about to pupate, it spins up a more solid shelter and there hangs itself up. The larval stage lasts about 27 days. The Pupa lasts some 15 days.

The Butterflies. The spring immigrants differ in habits from their later descendants or autumn suc-

VANESSA CARDUI

cessors. Each seems to take up a regular territory, a few yards only in size, which it patrols in short rapid flights, pausing to bask on the bare ground. These pitches are occupied for some 10 days, when the insect moves on and the same places are chosen by new occupants. Later in the year they retain the habit of patrolling a restricted area but are more eager for flowers, especially clover, lucerne, scabious, thistles, valerian, ivy, and other autumn flowers. Like the Red Admiral, this species flies in the dusk and even at night. Their flight is swift and powerful, and they are vigorous and fearless, returning to a chosen site again and again if missed by a butterfly net. Life 2-3 months.

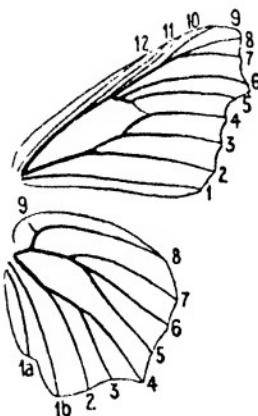
There are picturesque accounts of vast swarming migrations: 'countless numbers', 'obscured the sun', 'seen drifting for days' in the Mediterranean, and 'showers of blood' from the red liquid discharged after drying their wings, &c.

GENUS AGLAIS Dalman

One species, *urticae*

Closely allied to the following genus, *Nymphalis*, from which it differs only as follows:

The **Butterfly** has slightly shorter antennae, starting closer together, with fewer segments, and curving downwards rather than out. The wing shape differs slightly. The fore wing is relatively shorter and has less of a point at vein 2. The hind wing is less indented between veins 1a and 1b, and has less of a point at vein 4. There are said to be differences in the shape of the forehead, in the relative length of the leg segments, and in the genitals.





SMALL TORTOISESHELL

URTICAE



SMALL TORTOISESHELL

Aglais urticae

Habitat. Throughout Europe (except the Arctic) and Asia to Japan. Here, resident everywhere except the Shetlands and also some migrants from the Continent reported as arriving in July, August, and September.

Haunts. All kinds of country, particularly in the neighbourhood of man, road-sides, and lanes in spring, and gardens in summer and autumn.

Description. **Larva.** Black with yellow markings, which vary so much in number as to make the general effect vary from almost black to olive green; usually shading from black

above to olive below. Spiracles black on a yellow band. Fore legs and last pair black, others green.

Food-plant. Stinging nettles. In captivity will eat hops.

Pupa. Varies much in colour from highly gilt to dull brown. Hanging.

Butterfly. There is a normal variation in the orange colour, from pale straw to a rich red.

Varieties. These are very numerous, though mostly not striking, consisting of minor variations of the pattern. Three have been named: Ab. *polaris*, with a black bar joining the middle spot at the front of the fore wing to the large spot beneath it. Ab. *ichnusa*, without the 2 small centre fore wing spots. And Ab. *ichnusoides*, all 3 spots at the front of the fore wing joined in one and the 2 small dots faint or absent.

Identification. Small size, white spot on fore wing, and large area of black on hind wing. Contrast with Large Tortoiseshell, *polychloros*: much larger, no white, and only a relatively small black mark on hind wing.

SMALL TORTOISESHELL

Life cycle. Two generations a year (probably one in the north) hibernating as Butterfly. In addition immigrations of continental Butterflies have been reported in July, August, and September.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Butterfly -----				Eggs: Larva	Pupa	Butterfly -----					
						Eggs: Larva	Pupa	Butterfly -----			
with the addition of:											
								Immigrant Bfly-----			

Those that hibernate do not pair till April.

Life history. The **Eggs** are laid in one mass on the under side of the nettle leaves. The number may be as great as 1,000 and they are piled up in a heap. They hatch in about 10 days. **Larvae** are gregarious until after their 3rd moult. On hatching they split into groups of about 200 in each and seek separate nettles, over the points of which they spin a protecting web. As each plant is eaten they go on to another and repeat the process. After the 3rd moult they become solitary, some drawing together the edges of a leaf to form a tent, others feeding out in the open. When ready to pupate, after 4 moults, they seek a spot, either on the nettles or, more often, under the shelter of a wall or paling, sometimes as much as 60 yards away from any nettle. The **Pupa**, suspended, lasts about 12 days.

AGLAIS URTICAE

The Butterflies. One of our commonest and most widely spread species. In early spring those that have survived the winter pair in April and are found flying swiftly up and down and basking on the ground or vegetation on roads or lanes. Later broods become mainly garden Butterflies, seeking the blooms of buddleia, michaelmas daisies, scabious, knapweed, thistles, and other composite flowers. Those that remain dormant for many months seem to begin so to do in the hottest weather of the year, July or August, when they settle down, often in houses, churches, and other buildings, and remain motionless until spring. The life of these may be as long as 11 months: more than any of our other Butterflies except the Brimstone, *rhamni*. Can make a 'hissing' sound by rubbing the wings together.

GENUS NYMPHALIS Kluk

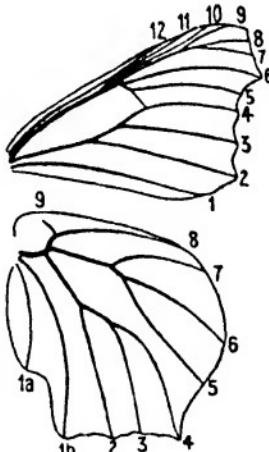
Two species, *polychloros* and *io*
(and *antiopa*, see Appendix)

Eggs as described under Family, p. 117. Laid in a mass.

Larva. Tubular, spiny, gregarious. Feed, some on trees, some on nettles.

Pupa. Angular, heads 2-pointed, usually metallic spotted.

Butterfly. Antennae, long with pear-shaped clubs. Eyes, hairy. Palpi, rather long, slanting forwards, hairy. Wing shape: fore wing has 2 projections at veins 2 and 6; hind wing has one at 4, and is markedly indented between Nos. 1_a and 1_b. Structure: fore wing cell closed by very faint cross bar, hind wing cell open.





LARGE TORTOISESHELL

Nymphalis polychloros

Habitat. Central and S. Europe, Armenia and Siberia. Here, resident and generally spread over S. England and Wales. Rare in the north, only a few records from Scotland, and not in Ireland. Local and subject to local extinctions, probably due to ichneumon flies.

Description. Larva. Black with amber markings and amber complex spines. Black disks on top of the last 2 segments. Fore legs and the last pair black; the others ochre.

Food-plant. Trees, chiefly common elm and wych elm. Larvae have also been found on sallows, willows, aspen, whitebeam, birch, cherry, and pear. They have been known to feed on nettles, but, when they do so, they produce only dwarfs of the size of the Small Tortoiseshell, *urticae*.

Pupa is the colour of a dead leaf and has more or less gold marking.

Butterfly. The female is slightly larger, otherwise the sexes are much alike. The markings of the females are rather larger.

On the under wing surface are long, fine, black bristles, some of which form a fringe along the front edge (or costa) of the fore wings.

Varieties. Few. The blue marks are sometimes absent, or lilac in colour, and sometimes black specks replace the yellow blotch between the 2 centre spots on the fore wing.

Identification. Note: size, 7 black spots on fore wing and no white, and bristly costa. Contrast with



LARGE TORTOISESHELL

POLYCHLOROS

LARGE TORTOISESHELL

the Small Tortoiseshell, *urticae*, which is smaller, and has 6 black spots and 1 white, and no bristles. The hind wings are quite different.

Life cycle. One generation a year, hibernating as Butterfly.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Butterfly - - - - -				Eggs Larva		Pupa		Butterfly - - - - -			

Life history. Eggs are laid on the highest branches of the trees, all together in one place, usually on a small twig, which they circle as a sleeve. They hatch in about 20 days. The Larvae are gregarious until about to pupate. After eating their way out of the eggs, they crawl to the young leaves, over which they spin a web and there feed, moving on to successive leaves. When, after 4 moults, they are ready to pupate, they fall from the top of the tree on to the ground and crawl off, individually, to find a place, usually on the upper branches of some other tree and often at some distance. Pupa, suspended, lasts about 14 days.

The Butterfly has been a rare species of late years. In spring the awakened Butterflies fly in sunny lanes and bask on the ground. Their flight is swift and powerful, with gliding intervals, and they pass to and fro over long distances as if quartering the ground. After emergence they only fly for a short time and are more rarely seen at this time than in the spring. Thus,

NYMPHALIS POLYCHLOROS

even where they are numerous, they are among the few species which the collector will rarely find in August. They seem little attracted by flowers and are mostly found settling on tree-trunks or buildings and feeding upon trees on which sap is running, or (in daytime) upon trees 'sugared' by a moth collector. They have been reported as settling on the heads of large sedums. Soon they go to hibernate among faggots, or in sheds, or hollow trees.



PEACOCK

Nymphalis io

Habitat. All Europe and Asia to Japan. Here, resident, rather local but common, throughout England and Wales, rarer northwards and in Scotland up to Moray. Common in S. Ireland. Said to desert industrial areas. There is some evidence of migration by this species.

Haunts. Clover fields, wayside banks, and gardens.

Description. **Larva.** Black with complex black spines: shiny disk on 1st segment and 2 on last: many white warts and bristles: hind legs ochreous.

Food-plant. Stinging nettle. In captivity they have fed on hops, producing unusually small butterflies.

Pupa. Varies much in colour according to its site: 2-horned, with gold marks.

Butterfly. The males are, on the average, slightly smaller, but the sexes are alike in pattern. Therefore, if one wishes to make certain of the sex of any particular specimen of this species, it is necessary to take a magnifying glass and examine the fore-legs, see p. 118. (This is advisable in the case of most of the Nymphalidae.) In the males nothing like claws will appear, whereas the females will be seen to have 4 sharp points, one from each joint of the foot, which project on the under side from the soft hairs covering it.

Varieties. There are very few, if any, natural variations in this species. Specimens are on record with a pale cloud in the centre of the fore wing.

In captivity, malnutrition has produced various changes in the eye-spots.



PEACOCK

♀

10

PEACOCK

Life cycle. One generation a year, hibernating as Butterfly.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Butterfly -----				Eggs Larva		Pupa	Butterfly	-----			

Life history. The **Eggs**, about 500 in number, are laid on the under side of the nettle leaves, all in a mass, piled up in the centre. They hatch, all together, in about 14 days. The **Larvae**, on hatching, spin a web over the leaf and begin to eat it. They are gregarious all their lives, assembling on a silk web (4 times) to moult, and returning to feed on the nettles, by day, between times. When about to pupate, they all march off together to seek a suitable place, not dispersing until the last moment. They have been seen to climb an adjacent oak tree. They are, rarely, found on the stems of the nettles on which they feed. The **Pupae**, possibly owing to this tree-climbing being a habit, are not often found, except as captives, and not much is known of their usual sites. They are suspended and hatch in about 12-14 days.

The **Butterflies** make their first flights after hibernation about the end of March and, at that time, seem to seek warmth rather than food, being found in the warmest and most sheltered corners, though they do feed on the blossoms of fruit trees, particularly of wall fruit. After emerging in summer, they

NYMPHALIS IO

usually remain on the wing till October and are to be found in gardens or where knapweed, thistles, scabious, or clover abound. They are especially fond of buddleia and bask much on walls and pathways. The favoured site for hibernation is a hollow tree, though buildings (dark) and log piles are recorded. They make a noise, described as a hissing, by rubbing the fore and hind wings together, in the same way as does the Small Tortoiseshell, *urticae*.

GENUS POLYGONIA Hübner

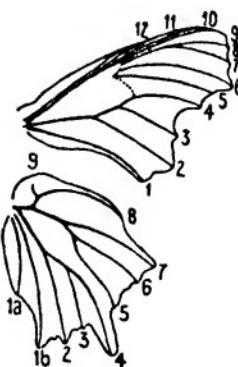
One species, *c-album*

Eggs as described for family, p. 117.

Larva. Remarkably coloured.

Pupa. Does not show odd wing shape.

Butterfly. Antennae, long, tapering at both ends of club. Eyes, hairy. Palpi, long and hairy. Wing shape unlike any other genus. Structure: cell of front wing closed by almost imperceptible cross-bar; that of hind wing, open.







COMMA

Polygonia c-album

Habitat. Europe and Asia, except the Arctic. Here, resident in south England and Wales, chiefly around Hereford. Not in Scotland or Ireland. After a long period of decrease, it began to increase about 1924.

Haunts. Lanes, gardens, hop-fields, and wood-clearings where there are many flowers.

Description. **Larva.** Black, marked with grey and orange, with a white saddle covering the hinder end from the 6th segment: complex yellow (white on the saddle) spines. On each lobe of the black head is a short club.

Food-plant. Stinging nettles and hops. Also sometimes on very different plants, e.g. currant bushes (white and red), gooseberry, and elm trees.

Pupa. Horned, not unlike a chess knight. Silver points and gold streaks. The wing-case is not angular.

Butterfly. The females are larger, their wings less ragged, and their under sides more uniformly brown. Both sexes have the white C. This species is remarkable in producing, in its first brood, a proportion of Butterflies of a different colour, known as the Pale Comma. This form (*hutchinsoni*) is shown in the three lowest figures in the plate opposite. A form almost intermediate between Normal and Pale is known.

Varieties. Marked aberrations are rare, though specimens of a pale straw colour and others of a rich mahogany red have been found. There is a good deal of minor variation in the size of the dark spots; the first two, at the fore edge of the fore wing, which usually touch, sometimes coalesce and sometimes are quite separate; and the borders differ in thickness. The Cs

COMMA

are sometimes formed as Gs, and sometimes Os. The under sides of the normal males and females vary a good deal in depth and intensity of colour.

Life cycle. Two generations a year. The first is divided into 'forwards', which breed the 2nd, and 'backwards', which hibernate as Butterflies, as do all the 2nd generation. Thus the hibernating Butterflies belong to 2 generations which pair promiscuously in the spring.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Butterfly (all normal)			Eggs								
			Larva								
			Pupa								
			Butterfly (pale & normal)								
			Eggs-								
			Larva--								
			Pupa-								
			Butterfly --								
			(all normal)								

Some 'Pales' have in very warm years been found in autumn, so the variation may be climatic.

Life history. The **Eggs** are laid, singly, on the upper side of a leaf, the April-May clutch hatching in about 17 days. The **Larva** eats its way out of the egg and then creeps under the leaf, where it spins a web and feeds by day. It is solitary, except when crowded in captivity, moult 4 times, and the May generation pupates in about 47 days. The **Pupa** hangs by tail-hooks from a silk pad spun on the stalk of a leaf or on the stem of the plant, and lasts 10-20 days according to weather. The changes of the later generation are much quicker in all stages.

POLYGONIA C-ALBUM

The **Butterflies** are swift, but short, fliers, somewhat lazy and inclined to bask and rest for longish times. They sometimes rest with closed wings and lying flat among dead leaves, from which they are almost indistinguishable. They are very fond of knap-weeds, hemp agrimony and other composite flowers, brambles, thistles, buddleia, as well as rotting fruit. In October they hibernate, seeking no special shelter but relying on their protective colouring, and settling on branches or tree trunks or among withered leaves.

GENUS APATURA Fabricius

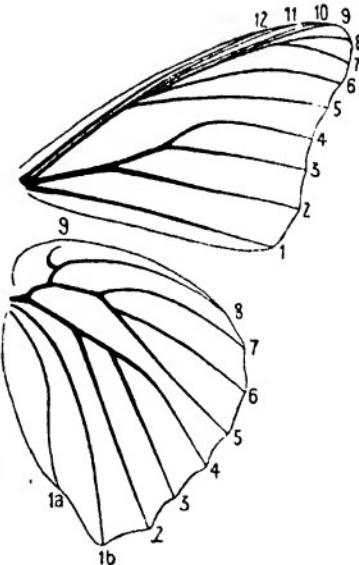
One species *iris*

Eggs differ from others of the family in shape and colour.

Larva. Unlike other Nymphalids. Slug-like, smooth, without bristles, pointed behind and with 2 horns on the head. Solitary.

Pupa. Narrow sideways, tapering to the head, leaf-like. Without angles or metal spots.

Butterfly. Antennae long, with thick clubs. Eyes smooth. Palpi erect, stretching beyond head, 3rd joint short and hairy. Wing structure: hind wing, veins Nos. 8 and 9 branch from a common stem. Both cells open.





PURPLE EMPEROR

♂

IRIS



PURPLE EMPEROR

Apatura iris

Habitat. Central Europe, Amur-land, and China. Here, resident, in S. England only and very local. Not in Scotland or Ireland. It is usually very scarce, but certain years occur in which it is fairly common. Thus in 1868, 1881, 1905, and 1911.

Haunts. Woods, chiefly oakwoods with tall trees.

Description. **Larva.** Slug-shaped, with 2 stiff snail-like horns on the head and a forked tail. Green with yellow warts and diagonal stripes.

Food-plant. Sallow.

Pupa. A pale bluish-green marked with white, flattened and just like the young sallow leaves.

Butterfly. The sexes are about the same size, but differ, the females having no sign of the rich purple refulgence seen, at certain angles only, on all the wings of the males. Their white marks are also broader than those of the males.

Varieties. Very few. A very rare type (called Ab. *iole*) has the white spots reduced to two.

Life cycle. One generation a year, hibernating as young (9 mm.) Larvae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva						Pupa					
						Butterfly					

Eggs -
Larva

Life history. Eggs are laid singly on the upper surface of the sallow leaf, near the edge (Frohawk says

PURPLE EMPEROR

almost always on the 'right' side) and hatch in about 14 days. The **Larva** eats a lid in the egg, comes out, and then finishes eating the eggshell down to the base. It then spins a web on the leaf, feeding by day at the edge of the leaf and resting along its rib. After its first moult, which takes 3 days, it first shows the horns. After a 2nd moult, when about 9 mm. long, it spins a web of silk, usually at a fork, and stretches itself out straight, looking like a bud. Thus it hibernates until the end of March or April, its colour changing with the sallow, becoming greener in the spring. When full grown its web takes up a whole leaf and it then goes to other leaves to feed, returning to its web to rest. The horns are stiff but mobile, carried cocked when crawling, and lying forward when at rest. If touched, it whisks the front of its body round, as if to toss the offender with its horns. When, after 4 moults, it is ready to pupate, it spins silk down the leaf-rib and secures its junction with the stem, so that the leaf will not fall. It then lies for 2 days with its head towards the stalk of the leaf, and then turns round, head to tail, and remains another 2 days before pupating. The **Pupa**, hanging by tail-hooks from the leaf-rib, lasts about 14 days.

The **Butterflies** are rarely seen, partly because they are uncommon, and partly because the male seldom leaves the highest branches of tall trees, usually oaks, although it has also been seen on a number of other trees. They seem to have favourite boughs and even leaves to which they return again and again and on which they are succeeded by others. In wet weather they rest on the trunks. They are rarely, if ever, seen

APATURA IRIS

on flowers, and both sexes, but particularly the males, have a great liking for decaying animal juices, being found at gamekeepers' 'museums' of dead vermin, in pigsties, and at the moisture oozing from middens. Collectors get them down from the tree-tops by pegging out putrid meat. I have only once seen this species in great profusion and that was on the 7th July 1924 near Vienne-le-Chateau in the tragic Bois de la Grurie, so frequently mentioned in the French dispatches during the War. The females usually fly lower, keeping among the sallows and only visiting the high trees for pairing. The flight of both sexes is very strong and swift and they will swoop at and past a man as if to look at him. The males are said to quarrel much amongst themselves. The Butterfly lives 4 to 5 weeks.

GENUS LIMENITIS

Fabricius

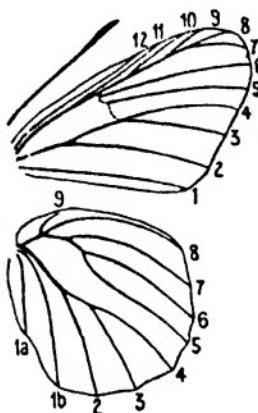
One species, *camilla*

Eggs. Quite unique, see p. 117.

Larva. Tubular, with bristles and complex spines on projections.

Pupa. Oddly shaped and metal-spotted.

Butterfly. Antennae clubs, long and tapering to both ends. Eyes smooth. Palpi upthrust and hairy. Wing shape: without points, hind wing slightly indented between 1a and 1b. Front wing, cell faintly closed; hind wing, cell open. Hind wing, vein 9 springs from the base of vein 8.





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WHITE ADMIRAL

CAMILLA



WHITE ADMIRAL

Limenitis camilla

Habitat. Central Europe and Spain, S. Russia, Corea, and Japan. Here, resident, in England in the south and Midlands. Local, recently regaining ground lost at the end of the 19th century. Not in Scotland or Ireland.

Haunts. Large woods.

Description. **Larva.** Irregular in shape with spines of different lengths.

Food-plant. Honeysuckle.

Pupa. Oddly shaped, with a prominent hump in mid-back; green with purple markings; head and under side decorated with silver and gilt spots.

Butterfly. Save in size, the sexes are much alike, but the females are usually browner (less black) above and paler underneath.

Varieties. Rare. Such as there are consist only of a total (*Ab. nigrina*) or partial (*Ab. seminigrina*) absence of the white markings. There seem to be years (e.g. 1881, 1896, 1918, and 1919) in which these freaks are unusually common.

Life cycle. One generation a year, winters as young Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva						Pupa					
						Butterfly					
						Eggs					
						Larva					

In very exceptional years, the Butterfly has been

WHITE ADMIRAL

seen as early as 21st May and a partial 2nd generation may be bred.

Life history. The **Eggs** are laid singly (not more than one upon a leaf, unless by different mothers) on the edge of the upper side of the honeysuckle leaf. They hatch in about a week. The **Larva** feeds by day and after its 2nd moult, about the end of August, prepares its winter quarters in a leaf of the food-plant. It strengthens the junction between leaf-stalk and stem with silk, eats off the greater part of the leaf and spins together the edges of the remaining part at the base and then lays itself along the leaf-rib, with its head towards the stalk. It stays thus, torpid, until the end of March, when it comes out and resumes feeding. When about to pupate, after the 4th moult, it hangs itself up by the hindmost pair of legs to a pad of silk spun on a stem or leaf-rib of the honeysuckle and, usually in about 30 hours, pupates. The **Pupa**, hanging by tail-hooks from the same pad, lasts about 13 days.

The **Butterflies** are famous as the most powerful, skilful, and graceful of all our species. They fly both high and low in the forest glades, swooping over the trees and, following with gliding flight the contours of every branch, rise again and return after a few minutes to repeat the same flight or to feed, with wide-spread wings, on the flowers of some bramble. This seems to be their only flower food and they do not share the fondness of the Purple Emperor, *iris*, for putrid meat. The oldest form of the English name was the 'White Admirable'. At night and in wet weather they rest under the leaves of trees. Life about 30 days. Their wings soon get torn by the

LIMENITIS CAMILLA

thorns of the brambles and they fall a prey to dragonflies, hornets, and birds, though they are said to suffer less than most Butterflies from ichneumon flies.

FAMILY RIODINIDAE (=ERYCINIDAE)

This Family, distinguished by the form of the fore legs, is numerous in Brazil, but has only one genus here or in Europe, of which the following are the characters.

GENUS HAMEARIS

One species, *lucina*

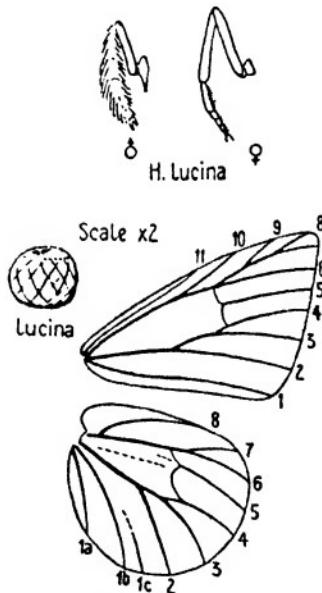
The *Eggs* are smooth and spherical, flattened at the base, yellow marked with purple.

The *Larva*, wood-louse shaped, broad, flat underneath, and tapering at both ends, with arched back, and hairy. Head retractile.

The *Pupa* is short and rounded, without projections, with a slight waist and a bristly surface. It is secured by tail-hooks and a silk girth.

The *Butterfly* has a small head, hairy eyes, antennae slender with flat, triangular clubs. The legs of the female are all perfectly formed, have 2 single claws, and are used in walking. The fore legs are smaller than the others. The fore legs of the male are still smaller and are not used for walking. The foot consists of one joint only without any claws, the hip joint (coxa) forms a spine, and the leg from the knee downwards is hairy. The wings are pointed. Wing structure: note, on front wing No. 6 starts from the apex of the discal cell at the same point as the stem of Nos. 7, 8, and 9.

There are several anal veins on hind wing.





DUKE OF BURGUNDY FRITILLARY

Hamearis lucina

Habitat. West and central Europe, Denmark, S. Sweden, central Spain, N. Italy, and the N. Balkans. Here, resident and common in S. England, rarer northwards to Cumberland. In Scotland near Dumfries only. Not in Ireland.

Haunts. Woodland clearings and rides.

Description. Larva. Wood-louse shaped, covered with long hairs; buff marked with purple.

Food-plant. Primroses and cowslips.

Pupa. Fat, rounded, and flat bellied; pinkish-yellow, marked with black and covered with brown warts bearing hairs.

Butterfly. The shape of the wings, and usually the greater size and brightness of the females, distinguishes the sexes. In colour a Fritillary, it is much more like a Blue in structure.

Varieties are few. The female has often larger tawny marks, and an aberration with little or no black is known.

Identification. Size alone should easily distinguish it from the Marsh Fritillary *aurinia*, but the patterns are very similar. There are, however, differences. Thus, on the under side, the single row of black dots encircles both wings. Contrast with *aurinia* which has them only on the hind wing.

In size, colour, and pattern, it is much like the Chequered Skipper, *palaemon*; but it can be distin-



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DUKE OF BURGUNDY FRITILLARY

LUCINA

DUKE OF BURGUNDY FRITILLARY

guished by (1) its small body and head without 'eye-brows' and (2) the presence of the black dots on many yellow spaces on both sides. *Palaemon* has no black dots on either side.

Life cycle. One generation a year, hibernating as Pupa. Double brooded abroad, it has been seen here in August, and in captivity Butterflies emerge all the winter.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----					B fly Eggs Larva						

Life history. The Eggs are laid in twos or threes (1-10) on the under surface of the leaves of the food-plant and hatch in 14 days. The Larvae eat the upper part of the eggshell and, after coming out, finish it. They move little, feed by day, and rest under the leaves, pupating there, after 3 moults, in about 43 days. The Pupa, lying along the leaf, tail down, is attached by tail-hooks and a girth of silk round the waist. It lasts all through the winter, hatching about mid-May.

The Butterflies are found only in woods, particularly frequenting sheltered valleys, hollows and sunny rides, or pathways. They are active, flitting over the undergrowth and choosing favourite low sites on which to rest. The only flowers on which

HAMEARIS LUCINA

they are seen are those of the wood-spurge and bugle. Their short life is only 14 days.

Although as above stated this species is much like a 'Blue' in most respects, with the colouring of a 'Fritillary', on the wing it looks like a dark specimen of the Copper, *phleas*.

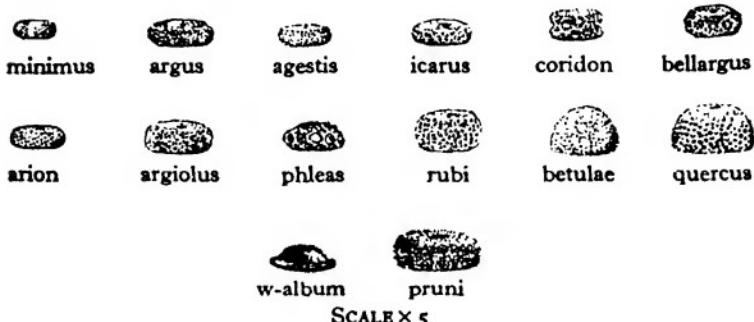
FAMILY LYCAENIDAE. THE BLUES, COPPERS, AND HAIRSTREAKS

This large family of Butterflies, which with us are all small in size, includes some of the most brilliant natural objects. Its three groups are easily distinguished. In the 'Blues' the sexes differ greatly and the females are usually dark sooty brown. The under sides of both sexes are usually grey and display a number of small dots or 'eyes'. The 'Coppers' (of which we have only one) are very like the 'Blues' except that the blue colour is replaced by a brilliant metallic copper sheen. The 'Hairstreaks', though structurally very similar, are quite unlike them. They have a thin white line, or lines, crossing the underside of the wings, in place of the 'eyes' of the 'Blues'. Their sexes differ much less. One of them (the Green, *rubi*) is exceptional in often having the hairstreak reduced to a single white dot, and in several other respects.

The Eggs, with few exceptions, are of one shape, that of a disk with rounded edges, such as would be assumed by a globe of dough if pressed flat until its

FAMILY LYCAENIDAE

height became less than half its diameter. This will here be called 'muffin-shaped'.



They have complex patterns formed of depressions set in geometrical order over their surfaces. These patterns differ and are a delight to any one who takes a microscope to study them.

The **Larvae** are wood-louse shaped, very short, broad and flat bottomed, tapering to both ends and rising high amidships. Their heads can be drawn back into the next segment. This enables them to burrow into leaves or buds and scoop out the contents without moving, and they are markedly lethargic. Some have glands which secrete a liquid beloved of ants, so that the ants tend and protect them from their enemies. The extreme use of this power will be seen in the case of the Large Blue, *arion*. Generally speaking, the Blues feed on legumes, the Copper on sorrel, and the Hairstreaks on trees.

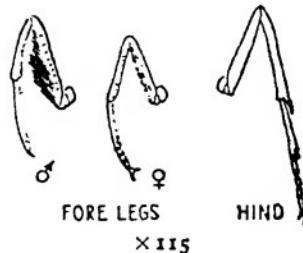
The **Pupae**, short and rounded, without horns or angles, are mostly suspended by tail-hooks and a girth. Some are formed underground and remain there.

BLUES, COPPERS, AND HAIRSTREAKS

The **Butterflies** have eyes, smooth in some species and hairy in others, surrounded by a conspicuous white circle; and short straight antennae with long clubs. Their fore legs are fully formed, with single, unforked, claws. Those of the males are smaller and, usually, more or less short of claws. The wing structure differs in the genera.

The fore wings have usually 11 (sometimes 10) veins. Usually Nos. 7 and 8 branch from a common stem after leaving the cell, but in *Callophrys* and *Strymon* no vein branches after leaving the cell.

The males of all 'Blues' (except *agestrus*) have battle-dore shaped scent scales, not localized but distributed over the upper sides of the wings.



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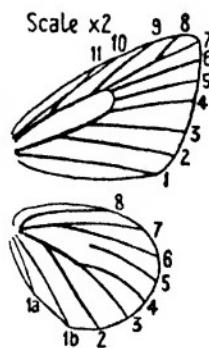
GENUS CUPIDO Schrank

One species, *minimus*

Eggs, Larva, and Pupa as described for family above.

The Larva has a honey gland, but there is no record of ant protection. The Pupa is hairy.

Butterfly. Eyes smooth. Distinguished from other 'blues' by the shape of the genitals and by the wing structure, in that veins 10 and 11 in the fore wing meet and run together before again separating, looking as though they crossed.





SMALL BLUE

Cupido minimus

Habitat. All Europe, except the Arctic, and through Asia to China. Here, resident throughout England and Wales, except some Midland counties: almost all Scotland, and in Ireland common in coastal districts, rarer inland. Everywhere very local.

Haunts. Rough grassy slopes on chalk or limestone.

Description. **Larva.** Slug-shaped with retractile head on long neck. Honey gland on 10th segment. Yellow, sometimes greenish, with pink markings, exactly like the flower of the food-plant.

Food-plant. Kidney vetch.

Pupa. Rounded, flat bellied, and but slightly waisted.

Butterfly. There is much variation of size in both sexes, but neither sex is habitually the larger. The females have none of the blue dusting seen on the males, and are slightly yellower underneath.

Varieties. The amount of blue dusting in the males differs, very blue specimens of large size are known as *Ab. alsoides*: the distinctness of the under side spots varies and they may be absent (*Ab. absoleta*). A rare male, pale grey above (*Ab. pallida*) exists.

Identification. The only sooty 'blue' having no orange on either side.

Life cycle. One generation a year, hibernating as fully grown Larva. In very exceptional summers, a partial 2nd brood.



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SMALL BLUE

MINIMUS

SMALL BLUE

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva				Pupa Bfly Eggs							
				Larva			Pupa Bfly Eggs	Larva			

In very warm summers, some

Life history. The **Eggs** are laid in the flower of the vetch, only one in a head, and hatch in from 5 to 7 days. In some cases more than one egg has been found in a flower. This is believed to be due to a mistake having been made by a second Butterfly which laid her egg where one had already been placed by another. The **Larva** bores through the flower to the growing pod which forms its food. If, when young, two meet, they fight and one eats the other. It moults 3 times and then settles down to hibernate, spinning together a few dead flowers, which it exactly resembles. In May it pupates. The **Pupa** has been found on a blade of grass, head up and attached by tail-hooks and a silk girth round the waist.

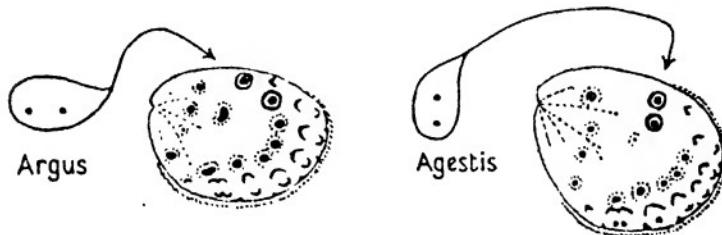
The **Butterflies** are found in warm hollows and sheltered places such as quarries or chalk pits. They are very local, living year after year on the same few yards of ground, and not found elsewhere for miles. They fly fast when travelling, but usually flit low over the ground, resting with open wings. If disturbed they fly round about rather than away. At night or in dull weather they rest on the under side of broad

CUPIDO MINIMUS

leaves. In the sunlight they may be found on the grass. Life only 15 days.

NOTE

In the text relating to several of the following species a contrast is made between species (e.g. *P. argus*) in which, on the under side of the hind wings, the two black-pupilled 'eyes' of the outer row which are nearest to the fore wings are arranged horizontally at right angles to the body, thus  as compared with *A. agestis* in which they are arranged as a colon, parallel to the body, thus :



The above sketches show the 'eyes' referred to, which are therein distinguished by being surrounded by a continuous black circle.

GENUS PLEBEJUS Kluk

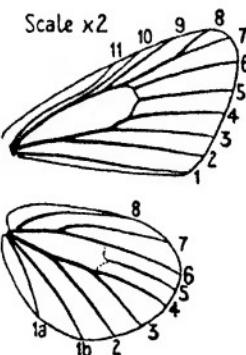
One species, *argus*

Eggs. Large, laid on stems, not leaves.

Larva. As described for Family. Honey gland on 10th segment, giving ant protection. Two retractile organs on 11th segment.

Pupa. Cocooned, not using tail-hooks.

Butterfly. Head small, forehead flat, eyes hairy. Antennae short (of the same length as the abdomen) with club one third of their length. Wing structure: fore wing cell large. Also distinguishable by genitalia.





SILVER-STUDDED BLUE

Plebejus argus

Habitat. Most of Europe and Asia to Corea and Japan. Here, resident, and locally common wherever there is heather and furze, and on some chalk downs. Commoner in the northern counties. In Scotland local up to Perthshire. Only two Irish sites recorded.

Description. Larva. Wood-louse-shaped, with retractile head hidden in 1st segment when resting. Honey gland on 10th segment and 2 retractile tubercles on the 11th, which are thrust out when it is scared. Pale green with dark markings.

Food-plant. Gorse and broom. Also eat bird's-foot, Scottish heather, and bell heather, petty whin, rest-harrow, and other leguminous plants.

Pupa. Smooth, round headed. Greenish-yellow with darker tail-end and whitish wing.

Butterfly. The male is usually, but not always, the larger. The sexes are quite different. The bright silver blue dots round the hind wing on the under side are common to both sexes and found in this species alone. The under side of the fore wing has no spots nearer the body than the central spot. The under side of the hind wing has the two black-pupilled 'eyes' of the outer row which are nearest to the fore wing arranged horizontally at right angles to the body, thus . .

Varieties. A form of the female (*Ab. corsica* or *masseyi*) has much of the blue of the male. Sometimes the under side spots are run together (*Ab. striata*) forming streaks, and sometimes (*Ab. obsoleta*) are



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SILVER-STUDDED BLUE

ARGUS

SILVER-STUDDED BLUE

lacking. Those on chalk downs are usually paler than others. ♂♀ specimens are recorded.

Identification. The silver-studs suffice to separate it from all other 'blues'. But note further that the male *icarus* has narrower black borders; that *coridon* and *bellargus* are larger, have 'laddered' fringes, and on the under side of the hind wing a central triangle mainly white; that *agestis* has the first two black-pupilled eyes on the under side of the hind wing arranged thus : as a colon; and that *icarus*, *coridon*, and *bellargus* have 2 dots nearer the body than the central spot on the under side of the fore wing.

Life cycle. One generation a year, hibernating as Egg.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----			Pupa Butly Eggs-----					

Life history. The Eggs are laid singly on the smaller shoots of gorse or broom, and do not hatch for about 8 months. The Larva eats a small hole in the shell and creeps out. It feeds, by day and night, on the flowers. It moves slowly, pushing its head out and drawing it back when crawling. When the flowers are over, it feeds on the tender young spines. When feeding on bird's-foot, for most of its life it eats only one side of the leaf. It moults 4 times and lasts about 12 weeks, attaining 13 mm. The Pupa does not hang

PLEBEJUS ARGUS

by the tail, but is suspended to the lower part of a stem by a few ropes of silk spun round it and lasts about 18 days.

The **Butterflies** are fond of warm hollows, particularly on sandy heaths and, when found, are often in great numbers. At evening and in dull weather they are said to mass together, settling to rest on heather or furze. They are not very active and flit low over the moorland vegetation. Life about 21 days.

GENUS ARICIA R.L.

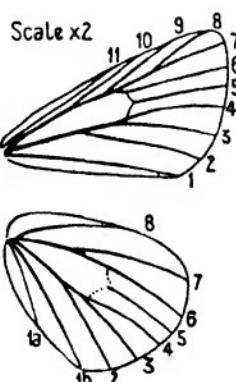
One species, *agestis*

Eggs. Small.

Larva. Hairy. Reported as protected by ants.

Pupa. Without tail-hooks. Either hangs by larval skin or is loosely cocooned with a few silk threads.

Butterfly. Very like *Polyommatus*. Eyes smooth. The position of vein No. 7 of the fore wing seems to vary, being sometimes on the front edge.





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BROWN ARGUS

AGESTIS



BROWN ARGUS

Aricia agestis

Habitat. Europe and N. and W. Asia, except the Arctic; also N. Africa. Here, resident and common in S. England and Wales; less so in the midland and northern counties. Local but fairly common in Scotland up to Aberdeen. Not in Ireland.

Haunts. Rough ground on dry hill-sides and chalk downs.

Description. Larva. Wood-louse-shaped. Pale green striped with dark green, purple, and pink; white spiracles and hairs; head black.

Food-plant. Rock-rose and stork's-bill.

Pupa. Rounded; without tail-hooks. Olive-yellow marked with purple, pink, and black. Over all a yellow network and tiny spines.

Butterfly. There is no blue anywhere in either sex and little difference between them. The female has more orange on the upper side and is usually browner underneath. Note the following points: (1) under fore wing, no spot nearer the body than the central spot; (2) under hind wing, the 2 black-pupilled eyes of the outer row which are nearest to the fore wing are arranged as a colon, parallel to the body, thus: (3) the fringes are white, usually brown-spotted at the vein ends.

Varieties. There are 2 other forms of this species both peculiar to Britain:

A.a.Ab. artaxerxes has (both sexes) a white discal spot on the fore wing (rarely also on the hind), and underneath all the eyes are 'blind', consisting merely of white dots. This is the Scottish form.

A.a.Ab. salmacis is intermediate between the Scotch

BROWN ARGUS

and S. English forms. The discal spot is surrounded with some white, and the pupils of the eyes are reduced to tiny dots. This form is found from Durham to the Scottish border.

Apart from the three forms named, several aberrations are recorded, such as: Ab. *obsoleta*, with any or all of the under side eyes lacking, except the discal spot. Ab. *striata*, with stripes made by the spots running into one another.

Identification. This species might be confused with the females of *argus*, *icarus*, *coridon*, or *bellargus*. *Agestis* alone has the : *Argus* has the silver studs. *Icarus* is definitely blue and has white fringes and *icarus*, *coridon*, and *bellargus* all have inner spots on the under side of the fore wings.

Life cycle. In England, 2 generations a year (in Scotland 1), hibernating as young Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva	-	-	-	Pupa- Butfly Eggs	-	-	-	-	-	-	-
In England.					Larva-	Pupa					
Larva	-	-	-	Pupa	Butfly	Eggs	-	-	-	-	-
In Scotland.							Larva	-	-	-	-

Life history. The Eggs are laid singly on the under side of a leaf, near the rib, and hatch in about 6 days.

ARICIA AGESTIS

The **Larva** eats its way out, Frohawk says sometimes at the top and sometimes at the side of the egg. It feeds, by night and day, usually on the under side of the leaf, making yellow spots as seen from the top. It sometimes bores through and sometimes eats the edge of the leaf. The June brood pupates in about 40 days. The later ones, about the time of their 2nd moult, lie down along the rib of a leaf and so hibernate until spring. The **Pupa**, having no tail-hooks, retains the skin of the tail end of the Larva and hangs by this and a silk girth, or (more usually) merely lies at the base of the plant to which it is fastened by a few silk threads.

The **Butterfly** is active when the sun is bright and darts about, resting upon flower heads and blades of grass, particularly marram-grass. Many are seen together and often with the Common Blue, *icarus*. Life about 21 days.

GENUS POLYOMMATUS

Latreille.

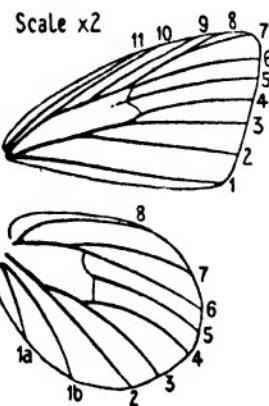
One species, *icarus*

Eggs as described for Family.

Larva. Wood-louse-shaped, as all 'blues'. With honey gland on 10th segment and so protected by ants.

Pupa. Smooth, without tail-hooks. The structure of the minute hairs is distinctive. In a slight cocoon, above ground.

Butterfly. Eyes hairy. Sex organs differ much from those of *Plebejus* and very slightly from those of *Lysandra*. In this, as in all 'blues', the cross-bars on both wings are barely visible.





COMMON BLUE

ICARUS



COMMON BLUE

Polyommatus icarus

Habitat. Europe, across Asia to China and N. Africa. Here, resident everywhere except the Shetlands.

Haunts. All types of country, high or low, preferring rough ground, downs, clover fields, and grassy lanes.

Description. Larva. Wood-louse-shaped, broad below, and grooved along the top. Honey gland on 10th segment. White serrated hairs, the longest along the back and sides. Head, black, retractile and hidden when at rest. Bright green with a dark stripe and 2 whitish stripes along the sides. Spiracles white.

Food-plant. Bird's-foot, black medick, rest harrow, and the various clovers. In captivity they can be fed on peas and beans.

Pupa. Head round; the tail has no hooks but retains the cast skin of the larva. Head ochre, body green, and wings ochre: the whole covered with a white network and tiny bristles.

Butterfly. The size varies much. The largest individuals come from the far north and the smallest from the south in years of drought. The following points should be noted: (1) fringes white, at least at their ends, without darkening of the vein ends; (2) the under side of the fore wing has two spots nearer the body than the central spot; (3) under hind wing, the 2 black-pupilled 'eyes' of the outer row which are nearest to the fore wing are arranged horizontally at right angles to the body, thus • •

Varieties. A very large number of aberrations occur, of which the following have been named: Ab. ♂ *clara*, a deep sky-blue. Ab. ♂ *pallida*, a pale lilac. Ab. ♀ *persica*, no spots on under hind wing except the outer

COMMON BLUE

row. Ab. ♀ *striata*, with under hind wing spots run into stripes. Ab. ♀ *arcua*, with 2 under fore wing spots run together. ♂♀ specimens are fairly common.

Identification. The male *icarus* is the only unmarked blue with white fringes, and orange on the under side. The female *icarus* differs from the female *argus* in having no silver studs, from the female *agesitis* in being bluer and not having the : on the under hind wing, and from the females of *coridon* and *bellargus* in having its fringes white and not 'laddered'.

Life cycle. In England and S. Scotland 2 generations a year, hibernating as *Larva*. The second is only partial. In N. Scotland and N. Ireland, only 1 generation a year.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----				Pupa---							
				Butterfly-							
and, except far N. and W., some:				Eggs-----							
				Larva-----							
							Pupa-----				
							Butterfly---				
							Eggs-----				
							Larva-----				

Life history. The **Eggs** are laid, singly, on the upper side of small leaves and hatch in about 9 days. The **Larva** eats all the crown of the egg and then makes its way to the under side of the leaf and feeds there, chiefly by night. Those which will breed in the same year are full fed in some 45 days. The greater number (even in the south) feed very slowly and will only have moulted twice by September, when they

POLYOMMATUS ICARUS

lie along the base of the plant near the soil, and so remain until March or April. By about mid-May (or a month later in N. Scotland) they have moulted 4 times and pupate, making a slight cocoon of a few threads and lying down at the base of the plant. The Pupa lasts 14 days.

Butterfly. Far the commonest of our 'blues' and the most widespread. They have most of the characters distinctive of the family: the short, low, somewhat jerky, and rapid flight, moving from flower to flower; great sociability, even with other species; resting on low plants or with the wings closed and the fore wings laid back between the hind. They fly little in dull weather, resting head down on the grass stems and are said to turn round, head up, after dark. Life about 20 days.

GENUS LYSANDRA

Hemming

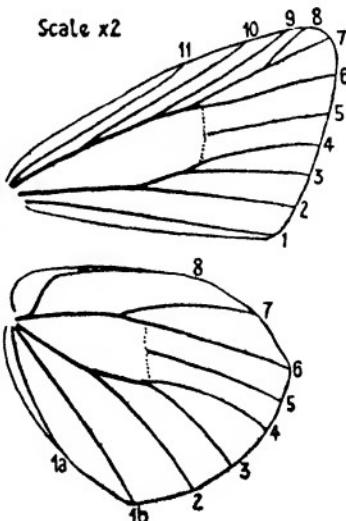
Two species, *coridon* and *bellargus*

Eggs. Larger than other blues except *Plebejus*; coarsely reticulated on outer edges.

Larva with marked ridges down the back and wide side flanges.

Pupa. Naked and smooth, without tail-hooks. Loosely cooed and under cover, almost below ground.

Butterflies differ (slightly) from *Polyommatus* in structure of sex organs. Not in wing structure. Eyes hairy.





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CHALKHILL BLUE

CORIDON



CHALKHILL BLUE

Lysandra coridon

Habitat. Most of S. and central Europe. Here, resident, and in many places very numerous in England, mainly in the south and centre. Not in Scotland or Ireland.

Haunts. Rough ground, particularly on chalk, oolite, and limestone, but only where the food-plant is found.

Description. **Larva.** Wood-louse-shaped, with central furrow down back. Head black and retractile. On the 1st segment, a green disk with complex spines; on the 10th, a honey gland; and 2 retractile tubercles on the 11th. Bright green with yellow stripes, white hairs longest on top, and black dots.

Food-plant. Horseshoe vetch. They are also reported as eating bird's-foot trefoil, and kidney vetch, and in captivity they can live on green peas.

Pupa. Round at both ends. Yellow with amber head and olive abdomen: warts hairy.

Butterfly. Very variable in size. The sexes differ in colouring and that of the male is unique in nature. It is partly due to the silky hairs which cover much of the wings. Note: (1) white fringes show the vein ends in brown; (2) under fore wing has 2 spots nearer the body than the central spot; (3) under hind wing has the two black-pupilled white eyes of the outer row which are nearest to the fore wing arranged horizontally, at right angles to the body, thus . . (4) on the upper side of the female hind wing there is white on the outer side of the black marginal spots.

Varieties. As in the case of the Common Blue a great number of aberrations are found. Amongst

CHALKHILL BLUE

them' the following have been named: Ab. *fowleri*, both sexes have the black border and some or all of the black spots in it replaced by white. Ab. ♀ *syngrapha*, all wings down to the orange border blue. Ab. ♀ *semisyrapha*, hind wing, blue as above; fore wing, basal half blue. Ab. *ochracea*, whole upper side pale ochre. Ab. *striata*, under side spots united into stripes. Ab. *minor*, very small specimens. There are many others, albinisms and occasionally ♂♀.

Identification. The four points mentioned should suffice to separate the females from other sooty 'blues'. The male is unmistakable. The chief difficulty is to know the females of *coridon* and *bellargus* apart. The 4th point noted characterizes *coridon*, while *bellargus* has blue in place of the white.

Life cycle. One generation a year, hibernating as Eggs.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva -----		Pupa -----		Butterfly	Eggs-----			

Life history. The Eggs are laid singly, and not necessarily on the food-plant, but always near it on some vegetation which in winter will die down and leave the egg hidden. Thus when the egg hatches, it is near to the food-plant when it grows in the spring.

¹ Note. In their Monograph on this species, Bright and Leeds illustrate, name and describe over 400 different British aberrations.

LYSANDRA CORIDON

The **Larva** eats a large hole in the top of the egg and then crawls out to the vetch, of which it eats both sides of the leaves, chiefly at night, and rests by day at the bottom of the stems. In its later stages it eats stems as well as leaves. There are 4 moults, taking about 68 days. When about to pupate it lies down at the base of the plant, hiding in a hole in the ground, without spinning any silk. The **Pupa** lasts about 30 days.

Butterflies. Active, powerful, and rapid fliers. They have been found at a distance from their usual breeding grounds. They behave in general as other 'blues', resting in dull weather, head down, on grass stems, often several together, and turning head up during the darkness. They have a habit of gathering into considerable packs in the rough grassy hollows of the hills and downs. Life about 20-30 days.



ADONIS BLUE

Lysandra bellargus

Habitat. Central and S. Europe, W. Asia, and N. Africa. Here resident and very abundant in a smaller area than the Chalkhill, *coridon*. In the south of England only.

Haunts. Chalk and limestone hills.

Description. **Larva.** Differs from those of *coridon* in being of a brighter green.

Food-plant. Horseshoe vetch.

Pupa. Head buff, wings ochre with green at bases, a fine brown network over all. Shaped as those of *coridon*.

Butterfly. Size varies much, but not between the sexes. Sexes totally different. Note the following points: (1) white fringes (less pure in the ♀) show the vein ends in brown (black in the ♂); (2) under fore wing has the two black spots nearer the body than the central spot; (3) under hind wing has the two black-pupilled white 'eyes' of the outer row which are nearest to the fore wing arranged horizontally, at right angles to the body, thus •• (4) on the upper side of the female hind wing there is blue on the outer side of the black marginal spots.

Varieties. There are many variations similar to those of the Common and Chalkhill Blues. The blue of the males varies towards lilac and greenish, and may even be a dull leaden grey. The blue on the female (usually only a mere dusting) sometimes forms the main colour of the wings and even covers the whole surface (= Ab. *ceronus*). The under sides of both sexes show much the same variations as *coridon*. ♂♀ rare.



ADONIS BLUE

BELLARGUS

ADONIS BLUE

Identification. The above points should suffice to contrast this species with all others except the females of the Chalkhill, *coridon*, which very closely resemble it. For this distinction see p. 208.

Life cycle. Two generations a year, hibernating as Larvae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----			Pupa-	Butfly	Eggs-	Larva--	Pupa	Butfly	Eggs-	Larva-----	

Life history. The Eggs are laid singly on the leaves of the food-plant, usually on the under side, and the time needed to hatch them varies from 18 to as many as 40 days according to the temperature. The Larva feeds by night. Those from the May-June eggs hibernate at the end of October at whatever stage has then been reached (at latest after the 2nd moult). They usually spin a layer of silk under a leaflet and there remain asleep until March when they resume feeding. There are 4 moults and when about to pupate the Larva hides itself in, or on the surface of, the ground, below the plant, usually forming a slight cocoon. Sometimes, in soft ground, they get half an inch below the surface. The Pupa lasts some 20 days.

LYSANDRA BELLARGUS

The Butterflies generally resemble the Chalkhill, *coridon*, in behaviour, but, though abundant where found, they are distinctly more local than *coridon*. Life about a month.

GENUS MACULINEA Van Eecke

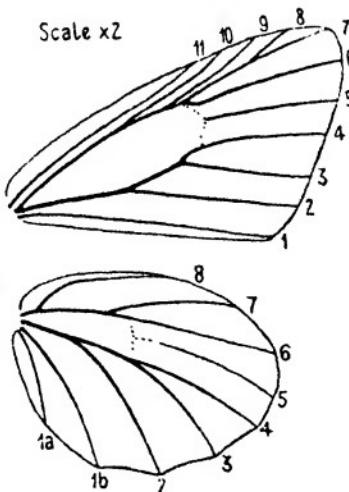
One species, *arion*

Eggs. Very small, laid on flower.

Larva. Unique in its appearance and life history. Honey gland gains not only ant protection, but ant-hill lodging and ant-larva food.

Pupa without hooks—lying in ant hill or on the ground.

Butterfly. Eyes hairy. The starting-point of vein No. 6 in the fore wing is unusual.





LARGE BLUE

Maculinea arion

Habitat. Europe except the Arctic and the SW.; also Armenia and S. Siberia. Here, resident, very local and restricted to the SW. of England.

Haunts. Open fields, hill-sides, and valleys.

Description. Larva has a shiny look due to the fact that after growing to a length of 3 mm. it never moults but merely stretches its skin. Honey gland on the 10th segment.

Food-plant. Wild thyme.

Pupa. Without tail-hooks, pale yellow, darkening, and with orange network over all.

Butterfly. Sexes differ.

Female is larger, black spots more numerous and heavier, and blue usually slightly brighter. Both sexes vary in the number of spots on both sides.

Varieties. The Gloucestershire specimens are darker and more violet than those from Devon or Cornwall. The spots may be reduced to one discal spot, or may be large and wedge-shaped. Under sides vary less, but the small spot at the base of the fore wing is sometimes lacking. A dwarf form of dull colour is known.

Identification. The only 'blue' with black spots on both wings above and no orange anywhere.

Life cycle. One generation a year, hibernating (in ant-hills) as Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----											
				Pupa							
				Butterfly							
				Eggs-----							
					Larva-----						



LARGE BLUE

ARION

LARGE BLUE

Life history. Most remarkable. It was discovered by F. W. Frohawk. The **Eggs** are laid singly on the flower bud of the thyme, growing on or near an ant-hill, and hatch in 7-10 days. The **Larvae** for their first 3 weeks live a normal caterpillar life, feeding on the blossoms of the thyme and, except that they fight and are cannibals if they meet, are blameless vegetarians. By mid-August they have moulted thrice and grown to a length of 3 mm. The honey gland appears after the 2nd moult and is fully developed after the 3rd. Then a change occurs. After resting for 6 hours, the Larva leaves the food-plant for ever, falls to the ground, and begins to wander about. The first ant it meets stops and fondles it with her feet. In response to this the Larva exudes a tiny drop of liquid from the gland, which the ant licks up. This 'milking' may last an hour, the ant leaving, but always returning. Finally the Larva takes up an odd attitude, distending its first 3 segments, whereupon the ant straddles the Larva, grips it behind the swollen segments, and bears it off to the ant-hill and down to the chambers where the youngest ant-larvae are kept. Here, for the next 5 or 6 weeks, it feeds upon the larvae of its hosts, without protest from the ants, although, apparently, it no longer gives them honey. During the winter it sleeps, waking in spring to resume its ungrateful feast. It attains full growth without again moulting, and then, still in the ants-nest, hangs itself up by the hind legs, turns a dead white and, in a week, pupates. The **Pupa** soon falls and lies there (about 3 weeks) till the **Butterfly** emerges. It crawls out through the ants' passages, leaves the nest

MACULINEA ARION

where it has dwelt 10 months, and climbs a stem on which it hangs till its wings are expanded and dried and it can fly.

Of ants, two species (*Myrmica scabrinodis* and *M. laevinodis*) are known as hosts, and it is thought that the dwarfs above mentioned may result from Larvae being carried to the nests of other less suitable species. The Butterflies lead the life of other 'blues'. They are found on rugged hill-sides covered with furze, bramble, heather, and wild thyme. The flight can be swift and straight, but is usually slow, heavy, and wobbling. In addition to laying on the thyme, the females take nectar from its flowers. They often take cover (and at night rest) in a furze bush or among rushes, standing head down by day and turning head up for the night. Life 15 or 16 days.

GENUS LYCAENOPSIS

Felder and Felder

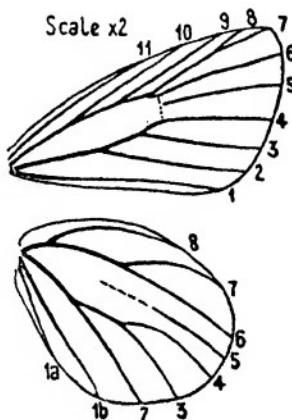
One species, *argiolus*

Eggs. Large, laid on buds.

Larva. Covered with minute star-shaped granulations. Honey gland on 10th segment and antprotection recorded. Food-plant unlike any other recorded of our 'blues'.

Pupa. Fat and short, wintering as such.

Butterfly. Eyes hairy. Antennae slightly longer than abdomen, tip broadly rounded. Palpi slender, 3rd joint almost as long as 2nd. Front wing cell long and narrow.





HOLLY BLUE

Lycaenopsis argiolus

Habitat. Europe (except the Arctic), across N. Asia to Japan, and N. Africa. Here, resident in England and Wales, rarer northwards. Locally common in Ireland: not found in Scotland.

Haunts. Woods, shrubberies, and gardens.

Description. Larva. Wood-louse-shaped, with retractile head, a groove along the back, and a ridge all round hiding the legs. Honey gland on the 10th segment. Varies in colour, being (1) pale green with pink markings, (2) greenish buff with rose markings and yellow lines, and (3) clear light green with no pink but yellow side lines.

Food-plant. Usually the spring brood lives on holly, the autumn brood on ivy. In spring other shrubs will serve: dogwood, buckthorn, spindle-tree, furze, broom, and young ivy leaves; and in autumn, dogwood, escallonia, and bramble.

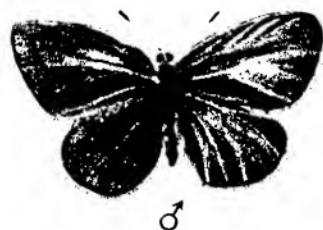
Pupa. Glossy with minute hairy warts: pinkish buff, marked brown and black: has tail-hooks.

Butterfly. Sexes alike underneath, markedly different above. The black border of the female is narrower in the spring brood.

Varieties. Mainly in the colour of the blue, which in extreme cases varies from a pale silvery pearl grey (*Ab. clara*) to a rich purplish blue. Marked aberrations are very rare. One ♀♂ specimen is known.

Identification. The only blue 'blue' with no spots on the fore wing above and no orange anywhere.

Life cycle. One, usually 2, and sometimes probably 3 generations a year, hibernating as Pupa. The 2nd generation is only partial, that is to say, some of



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HOLLY BLUE

ARGIOLUS

HOLLY BLUE

the Pupae born from the 1st generation develop into Butterflies which breed again in the year, while others hibernate over the winter. In Ireland there is said to be no second generation. The 3rd generation is inferred from the existence, in long summers, of Butterflies on the wing in October.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----			Butterfly--	Eggs-----	Larva----						
some: others:						Pupa-----	Bfly Eggs Larva				
and sometimes some: surviving to pupate?								Pupa-----	Bfly Eggs Larva	Pupa---	

Life history. The spring Eggs are laid on the flower-heads of the holly, several on a bush, but one only on a flower, and hatch in about a week. The Larva eats the crown of the egg and then turns to the holly, eating the flower buds, the unripe berries, and also the young leaves. It is very sluggish and rarely quits the flower on which it is feeding. It eats its skin after the first moult. There are 3 moults. When full grown, it changes to a purplish pink, leaves off feeding, and wanders about for a day or two before pupating. The Larva lasts about a month. The summer eggs are laid on ivy, and the Larvae feed on the buds and young ivy berries. The Pupa hangs along the under surface of a leaf, or other object, by tail-hooks

LYCAENOPSIS ARGIOLUS

and a silk girdle round the waist. The pupal stage lasts about 18 days if not prolonged by the winter.

The **Butterfly** differs in its habits from the other 'blues', resembling rather the 'hairstreaks'. It flits about over the tops of the shrubs, resting at night and in dull weather among the leaves. It sometimes visits the flowers of lilac, buddleia, wild hyacinth, and dandelion, but prefers the sap of trees (particularly oak or birch) to any flower. It drinks at puddles in dry weather and has been seen sucking moisture from cow-pats. Life about 20 days.

GENUS LYCAENA Fabricius

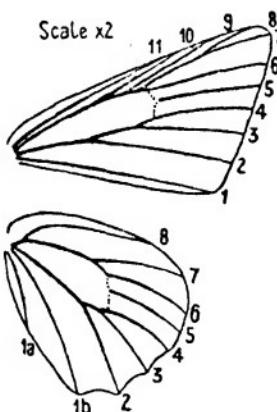
One species, *phleas*

Eggs. Domed, with central depression smaller than in any of the 'blues' (less than $\frac{1}{8}$ th of width of egg).

Larva. Head large and not extensible. The highest part of the larva is in front of the centre.

Pupa. Very short and fat, covered with minute bristles.

Butterfly. Eyes smooth. Antennae long ($1\frac{1}{4}$ times abdomen) with a long club. Palpi very short, 3rd joint half length of 2nd and covered only with flat scales, the other two fringed with long upturned hairs. The feet have many clustered spines on the under sides. Wing shapes vary in the two sexes. Structure as 'blues'.





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SMALL COPPER

PHLAEAS



SMALL COPPER

Lycaena phleas

Habitat. Most of Europe, across Asia to Japan, and N. Africa. Here, resident and common throughout U.K. but not north of Morayshire.

Haunts. Open ground, fields, downs, rough ground, banks, lanes, heaths, and sandhills.

Description. Larva. Wood-louse-shaped, without crest or central groove. Head green, covered with tiny white warts and red brown hairs. Some have not the pink stripes.

Food-plant. Sheep sorrel and, sometimes, the common sorrel.

Pupa covered with very minute flower-like projections. Pale ochre spotted with red, brown, and black.

Butterfly. No mere paint can render the brilliant burnished copper colouring of these butterflies. The sexes differ in the shape of the wings as well as in the width of the copper band round the hind wing.

Varieties. Minor variations are very numerous and among them the following have been named: Ab. *coeruleopunctata* has a row of blue spots on the hind wing. Ab. *obsoleta* has only black on the hind wing. Ab. *radiata* only a few copper rays on the hind wing. Ab. *suffusa* is also blackened, the fore wing being almost wholly black. Ab. *radiata* has the black dots on the fore wing formed as long wedge-shaped stripes. Ab. *alba* (= Ab. *schmidti*) has white in lieu of copper. Specimens with the copper a pale brass colour have been called Ab. *intermedia*.

Identification. No confusion is possible. Our only 'copper'.

SMALL COPPER

Life cycle. Usually 3 generations a year, hibernating as Larvae, in various stages of growth. A partial 4th generation is inferred from the occurrence of newly emerged Butterflies in late October in hot years.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva		Pupa		Butterfly							
		Eggs		Larva	Pupa	Butterfly	Eggs	Larva	Pupa	Butterfly	Eggs
		Larva	Pupa	Butterfly	Eggs	Larva	Pupa	Butterfly	Eggs	Larva	
some wintering, if cold: normally:											
and possibly sometimes:											
									Bfly		
									Eggs		
									Larva		

Life history. The **Eggs** are laid singly, but several upon the same leaf of the sorrel, mostly on the under sides of the young leaves, also sometimes on those of neighbouring plants, and hatch in about a week. The **Larva** eats a hole in the egg and then emerges and at once begins to eat a furrow in the leaf, in which it lies, making a groove as it eats. Only after the 2nd moult does it eat right through the leaf. The skin is not eaten after moulting. There are 4 moults and in summer the Larva may pupate in 3 weeks. Those which have not pupated at the end of October spin a layer of silk under the sorrel leaves and there hibernate till March, but they sometimes move and

L YCAENA PHLEAS

feed on warm winter days. The Pupa is fastened to the sorrel leaves by tail-hooks and a silk girdle and lasts from 25-30 days.

The **Butterfly** is one of our most active species and, though a short flier, one of the swiftest. It settles largely upon composite flowers, particularly fleabane, and darts off from one head to another with great speed. They have a habit of pursuing others of the same or other kinds (in anger or play?) returning to the flower on which they were before these raids. Life about 18 or 20 days.

GENUS CALLOPHRYS Billberg.

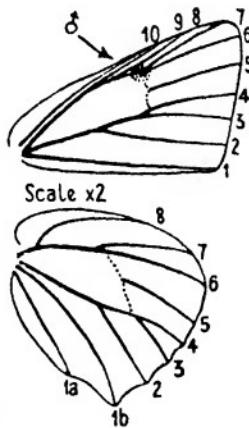
One species, *rubi*

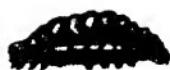
Eggs. Similar to those of the 'blues' but green.

Larva. Much as those of the 'blues'; sides concave with broad side-flanges; small honey gland, but no reports of ant-protection. A mixed feeder and cannibal.

Pupa. Fat and short, covered with spines and having a few tail-hooks. Loosely cooed.

Butterfly. Antennae shortish, swelling abruptly to the club. Eyes prominent and hairy. Palpi, thrust forward, slender and short; 2nd joint with long hairs beneath, 3rd joint half length of 2nd, moderately haired. Wing structure: front wing only 10 veins, none of which fork after leaving the cell. Cross veins on both wings very faint. Male scent-scales in a patch at the forking of veins 6 and 7 of fore wing.





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GREEN HAIRSTREAK

RUBI



GREEN HAIRSTREAK

Callophrys rubi

Habitat. Almost all Europe, Asia to Japan, and N. Africa. Here, throughout Britain. In Ireland local. Not in Orkneys, Shetlands, or Isle of Man.

Haunts. Woodland clearings, forest edges, chalk downs, boggy heaths, and any rough ground with many bushes.

Description. Larva. Wood-louse-shaped with a furrow along the back. The head (brown with a white band above the mouth) is hidden in the 1st segment, even when feeding. The 1st segment has a yellow disk on top

and the 10th a honey gland. The sides are flattened out into a projecting shelf. Green, marked with yellow and with brown spines.

Food-plants. Numerous and varied. Broom, gorse, dwarf gorse, dogwood, buckthorn, rock rose, dyer's greenweed, whortleberry, cowberry, bramble flowers, bird's-foot trefoil, green peas, and runner beans.

Pupa. Stout, green, turning to dark russet-brown, marked black and covered with minute dark brown spines. It has a few tail-hooks which are not used.

Butterfly. Varies a good deal in size. The male has a small oval spot of scent-scales in the disk on the fore wing; these show black in fresh specimens, pale when their scales have fallen off.

Varieties. There is much normal variation in the white spots on the under side of the hind wings. In about a fifth of British specimens these spots are numerous, forming a band round the hind wing and even rarely round the fore wing also. They may be lacking altogether (= Ab. *immaculata*) or they may

GREEN HAIRSTREAK

even, still more rarely, be run together into a continuous 'hairstreak'. As a rule, the farther north one goes the more these white spots appear. Sometimes there are one or two orange dots on the hinder edge of the hind wings, particularly in the females. Rarely the upper sides are yellowish.

Identification. The green under wings prevent any confusion arising.

Life cycle. One generation a year, hibernating as Pupa.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----				Butt fly	Eggs	Larva	Pupa-----				

Life history. The Eggs are laid, singly, on the young shoots or flowers of the various food-plants. They hatch in about 8 days. The Larvae are chiefly remarkable for being largely cannibal after their first moult. They fight and eat each other, and those which have already moulted take advantage of those still engaged in moulting. There are 3 moults in all and the Larva lasts about 25 days. The Pupa, though it has a few tail-hooks, is not hung up but only covered with a few silk threads. When dry, it can make an odd creaking noise. It is not clear how this is done, but it is probably due to slight movements causing friction between its segments.

CALLOPHRYS RUBI

The **Butterfly** is a swift but short flyer. It often sits on the leaves of trees and on bramble, furze, or thorn bushes, flying off for short flights and then returning. The colouring of the under side is a perfect camouflage when it is sitting still among leaves. It has been kept alive for 6 weeks.

GENUS THECLA Fabricius

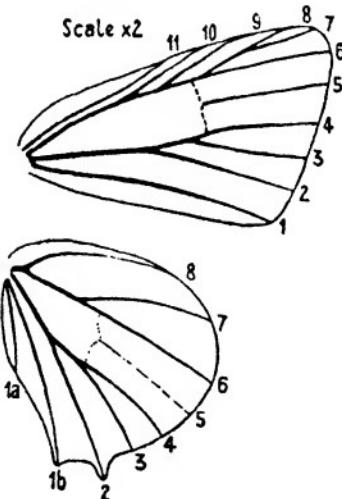
Two species, *betulae* and *quercus*

Eggs. Domed and white, wintering as such.

Larvae. Much as 'blues': sides and underneath flat and triangular as seen from in front. Tree feeders.

Pupae. Fat and short: without tail-hooks. Not girt but lying attached by larval skin.

Butterflies. Antennae with gradually widening clubs. Palpi short, particularly 3rd segment. Eyes prominent and hairy. Wing structure: front wing has 11 veins, Nos. 7 and 8 forking near the tip. Both cross-bars, and vein 5 of hind wing, faintly indicated or absent.





BROWN HAIRSTREAK

BETULAE



BROWN HAIRSTREAK

Thecla betulae

Habitat. Most of central Europe, France, Scandinavia, S. Russia, Armenia, and central Asia to China. Here, local but widespread in England up to Norfolk on the E. and Westmorland on the W. In Ireland in the S. and W. Not in Scotland.

Haunts. Wooded valleys and open bushy spots, particularly near the coasts.

Description. **Larva.** Wood-louse-shaped, flat beneath, ridge crested, splay sided and triangular in cross-section. Green, becoming lilac with purple marking when full grown.

Food-plant. Blackthorn. In captivity, plum trees.

Pupa. Rounded with flat belly. Ochre, marked purple.

Butterfly. The sexes differ so much as once to have been taken for two species. The under sides are similar save that the females are darker and richer in colour.

Varieties are few. The pale ochreous blotch on the male may be made up of 3 or 4 separate marks, or it may be definitely yellow (= Ab. *spinosae*), or white (= Ab. *pallida*). The female may have the orange marks on the fore wing small and divided, or the orange marks of the hind wing may be joined in a continuous band. ♂♀ very rare.

Identification. On the under side, note the white body and the *two* hairstreaks. The only other 'hairstreaks' which are fulvous underneath have brown bodies and only one hairstreak or row of dots. These

BROWN HAIRSTREAK

are the Black Hairstreak, *pruni*, and the White Letter Hairstreak, *w-album*.

Life cycle. One generation a year, hibernating as Egg.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----		Pupa-----		Butterfly Eggs-----				

Life history. The Eggs are laid singly on twigs of the blackthorn, usually close to a bud, and remain unhatched through the winter. The Larvae moult 3 times and last about 75 days. When about to pupate, they flatten themselves along the under side of a leaf of the food-plant (sometimes on other things). The Pupa retains the Larva's skin and is not girt or in any way fastened with silk, nor is it suspended. It lasts about 25 days.

The Butterfly, though not uncommon, is not often seen and is hard to catch. Most of its time on the wing is spent on the tops of high oaks. It flies only in the sunlight; when the sun goes in it becomes torpid, so much so as to allow itself to be taken with the hand. When seen near the ground, it has usually gone there either for the purpose of laying its eggs on the blackthorns, or because it has come down to get to the flowers of the bramble, which it much enjoys. Even then it is too often seen flitting along hedges well ahead of a would-be collector. They are reported as

THECLA BETULAE

quarrelsome and constantly fighting with the Purple Hairstreak, *quercus*. There seems to be no connexion with the birch (*betula*) after which it is wrongly named. Life about 21 days.



PURPLE HAIRSTREAK

Thecla quercus

Habitat. Central and southern Europe and Trans-Caucasia. Here, resident, in oak woods throughout Britain except in the extreme N. In Ireland, in the S. and E.

Haunts. Forests of oaks.

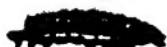
Description. Larva. Wood-louse-shaped, broad and flat; a pearly disk on the 1st segment and a dark one on the last. Ochre, with black, white, and brown markings.

Food-plant. The common (pedunculate) oak. Recorded also on sallow and spanish chestnut, *Castanea vulgaris*.

Pupa. Rounded and fat, without tail-hooks. Red-brown marked with dark purple, glossy and covered with tiny spines.

Butterfly. Female usually smaller. The two sexes differ more than can be conveyed by the coloured plates. The male is a dark purplish blue, except round the borders, the purple shade showing only at certain angles of vision. The female has a smaller area, divided into three by black nervures, which is coloured with a much more brilliant bluish purple. This is also 'shot' so that the colour is seen only at certain angles. In a way it is similar to the colouring of the male Purple Emperor, *iris*. The under sides of the sexes are alike.

Varieties. These are few and unusual. The size and colour of the female purple patches varies, and, rarely, they are deep blue. Some males have been found with an orange patch at the end of the disk on



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PURPLE HAIRSTREAK

QUERCUS

PURPLE HAIRSTREAK

the fore wing. These have been called Ab. ♂ *bellus*. ♂♀ very rare.

Identification. The purple colour above and the grey under side are both unlike any of our other butterflies.

Life cycle. One generation a year, hibernating as Eggs.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----		Pupa-----		Butterfly-----	Eggs-----			

Life history. The **Eggs** are laid singly on the twigs of the oak, close to the buds, and do not hatch until the following April. The **Larva** takes a day to eat a hole in the crown of the egg and then finds the tips of the opening bud and eats its way into it. It spins silk over the leaf bases and remains more or less hidden in the buds. When about to pupate, a week or so after its 3rd moult, it leaves the buds, spins a few threads for concealment and lies down, probably (?) on the branches or trunk of the oak. It has also been found on, or even under, the ground. The **Pupa** retains the larval skin and lasts about 36 days.

The Butterfly. Though the commonest of our Hairstreaks, it is but seldom seen and is hard to catch, because it spends most of its time on the highest branches of forest trees. It sometimes comes to lower

THECLA QUERCUS

levels to visit aspens where it is believed to feed on the honey dew left by aphides, but it does not seem to feed on flowers. They are very pugnacious, flying off to attack insects of their own or other species. There is even a story of one which repeatedly attacked a wasp until killed by it. Life about a month.

GENUS STRYMON Hübner

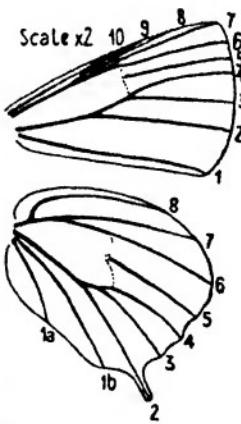
Two species, *w-album* and *pruni*

Eggs. So different that some divide the genus, see p. 188.

Larvae. Wood-louse-shaped and spiny. Tree feeders and (some of them) cannibals.

Pupae. Short and fat: with tail-hooks. Fastened by these to a silk pad and also girt with a silk band.

Butterflies. Antennae swell gradually to the club. Eyes hairy, of varying size. Palpi moderately long and outstretched. Wing structure: front wings have only 10 veins, none of which branch after leaving the cell. Hind wings have tails at vein No. 2 and a broad, large, cell. Both cross-bars very faint.





WHITE LETTER HAIRSTREAK

Strymon w-album

Habitat. Central and S. Europe, except the Peninsula. Here, resident, in England, as far north as Yorkshire, and in Monmouth. Very local and variable in numbers from year to year.

Haunts. The outskirts of woods.

Description. Larva. Wood-louse-shaped, much humped, and with a groove along the back. On the 1st segment a square white disk and on the 10th a gland (exuding liquid?). Variable in colour, sometimes brown with pink marks.

Food-plant. Wych elm and, more

rarely, the common elm.

Pupa. Stout and rounded at both ends; with tail-hooks. Ochre marked with dark purple, white bristles, and a net pattern.

Butterfly. The male has a small patch of pale scent-scales at the end of the cell, and shorter tails. Otherwise sexes alike.

Varieties, very few. The white W may be unusually thin and, very rarely, is absent altogether. One Butterfly is on record with the W widened into a broad wedge at one end on both wings.

Identification. The brown under side with a single hairstreak only, is enough to contrast it with all other species except the Black Hairstreak, *pruni*. To distinguish these, note that *w-album* has only one, faint, orange spot at the bottom angle of the hind wing and, on the under side, a good clear W in white and a black outline inside the orange border. *Pruni* has several orange spots above, and, underneath, at best a broken



WHITE LETTER HAIRSTREAK

W-ALBUM

WHITE LETTER HAIRSTREAK

W in bluish white bordered with black on the inside, and black dots, instead of a black line, on the inner side of the orange border.

Life cycle. One generation a year, hibernating as Egg.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs		Larva		Pupa		Butterfly	Eggs				

Life history. The **Eggs** are laid singly in the forks of the twigs of the elms and do not hatch until the following spring. The **Larva**, after eating its way out of the top of the egg, goes at once to the buds of the elm, upon which it feeds, entering head first and thereby remaining half covered, as it leaves the outer shell of the bud intact. Later it feeds upon the blossoms. There is no evidence of cannibalism at any stage. There are 3 moults and it pupates on either side of a leaf, at a fork, or among the winged seeds of the elms. The **Pupa** is fastened to a layer of silk by the tail-hooks and by a girdle of silk round the waist. It lasts about 26 days.

The **Butterflies** usually spend the greater part of their time flying over the elms, and they also have the uncommon habit of crawling about the trees, opening and shutting their wings as they go. They are not, however, to be found only upon wych elms or elms, as they have a taste for honey which sometimes takes

STRYMON W-ALBUM

them to a flowering lime and, occasionally, they come down, in very great numbers, to feed upon the blossoms of brambles, privet, mustard, thistles, or other plants. There are years in which they are seen in great numbers in places where they have previously been unknown. Life about 20 days.



BLACK HAIRSTREAK

Strymon pruni

Habitat. Central Europe, N. and central Italy and Dalmatia, and across Asia to Corea. Here, a very rare and local resident in the English midlands only.

Haunts. Woodlands.

Description. Larva. Wood-louse-shaped, humped, with a groove along the back. The head, when seen, is white. Green with yellow stripes and spines, and purple and white marks in the groove.

Food-plant. Blackthorn; can be kept in captivity on plum trees.

Pupa. Short and humped, shiny brown-black with ochre and white marks.

Butterfly. Sexes differ on the upper side, the male having a dark patch of scent-scales (often hard to see) and no orange on the fore wing. The colour is not noticeably blacker than the last species (*w-album*).

Varieties. Few and rare. There is some variation in the width and brightness of the orange on both upper and under sides, and, very rarely, the males show the orange spots on the fore wing which are usual with the female. Buff-coloured specimens have been caught.

Identification. The only other species with which confusion is likely is the White Letter Hairstreak, *w-album*. Both are brown on both sides and have only one hairstreak. *Pruni* has several orange spots on the upper side. On the under side its hairstreak is



BLACK HAIRSTREAK

PRUNI

BLACK HAIRSTREAK

bluish white bordered with black on the inner side and there are black dots on the inside of the orange borders to the hind wings. In contrast, *w-album* has only one faint orange spot on the upper side, and, on the under side, the hairstreak forms a clear white W and the orange border is outlined on the inside with a black line, not dots. Further, the colour of the under side is more orange-brown (less grey) in *pruni*.

Life cycle. One generation a year, hibernating as Egg.

TIME-TABLE :

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----		Pupa-----						

*Butterfly
Eggs-----*

Life history. The Eggs are laid singly on tall blackthorns, the mother crawling about the bushes, as do other hairstreaks, and laying at the twig forks. They do not hatch till the following spring. The Larvae eat their way out of the eggs and feed on the opening buds. There are 3 moults and, in captivity at least, they are cannibal. For the last 10 days (after the last moult) they are said to feed by night and day, without rest or sleep. The larva lasts about 2 months. The Pupa is fastened to a stem or leaf of the sloe, or other plant nearby, by tail-hooks inserted in a pad of silk and by a silk girth. It looks just like a small bird's dropping.

The Butterfly is the rarest of all our resident

STRYMON PRUNI

butterflies. It is reported as hard to catch and shy, rising to the tree tops if disturbed. It feeds on privet blossoms, guelder roses, and the flowers of the wayfaring tree. At night or in dull weather it rests under leaves, often of brambles. Life about 20 days.

FAMILY PIERIDAE THE WHITES AND YELLOWS

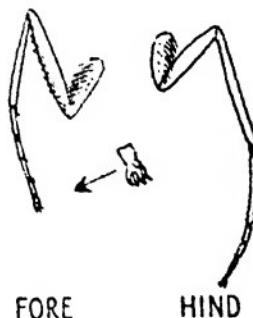
This family is distinguished from others by the following characters:

(1) Both sexes have all six legs fully developed, with 5 joints in the feet, and all six are used in walking.

(2) The claws are forked, so that each foot appears to have 4 claws.

(3) As in most other families, there are two anal veins in the hind wings, and the body lies as it were in a groove formed by the hinder edges of the hind wings.

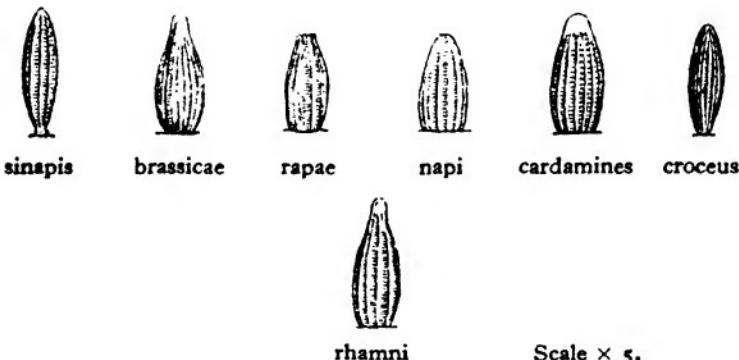
Our species are all predominantly white or yellow, with little other colouring except some black markings. Only one other British Butterfly shares this type of colouring and that is the Marbled White, *galathea*, which, as already mentioned, belongs to quite a different family, the *Satyridae*. In spite of its English name, it is not a 'White' at all.



FAMILY PIERIDAE

Their flight is fluttering and somewhat slow, but, in spite of this, the family includes 4 of the few species which come as migrants to this country: the 3 species of the genus *Pieris* and the Clouded Yellow, *croceus*.

Their Eggs are different in shape from those of any of our other families, being all bottle-shaped and taller than they are wide.



They are pale yellow in colour, except those of the Orange Tip, *cardamines*, which are orange and those of the Clouded Yellow, *croceus*, which are pink.

The Larvae are tubular, smooth or downy, tapering towards the ends, and without any horns or forks. As the Eggs are sometimes laid all together and sometimes in smaller groups or singly, so the Larvae are sometimes gregarious and sometimes solitary. These differences occur even between members of the same genus: *Pieris*. All but three feed upon *Cruciferae*, and the Large White, *brassicae*, and the Small White, *rapae*, are our only Butterflies which (as Larvae) do injury to our food-supply.

WHITES AND YELLOWS

The **Pupae** are angular, narrow, and tapered to a point or points at the head. They are all girt, that is fastened by tail-hooks and a girdle round the middle.

The **Butterflies** have rather small heads, antennae long and distinctly clubbed, and eyes round and hairless. The palpi differ in length. The wings are mostly rounded and without indentations. The only exception is the Brimstone, *rhamni*. In the fore wings they have 10 to 12 veins, none of which are enlarged at the base. In the hind wings there are always 2 anal veins and 7 others, while in addition there is a pre-costal vein (No. 9) in most species.

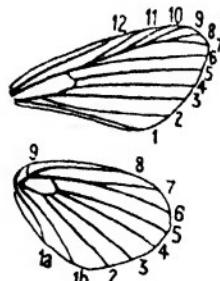
GENUS LEPTIDEA Billberg

One species, *sinapis*

Larva. Slightly downy, tapering. Feeds on Leguminosae.

Pupa. Long, thin, angular, with spiked head. Girt.

Butterfly. Antennae short, ringed, and with flattened, oval clubs. Palpi, thin, longer than the head, and hairy. Body, thin and long, extending beyond the wings. Wings, rounded, very weak and unsubstantial; all veins thin. Fore wings have 12 veins, Nos. 7-11 all branch from one stem after leaving the cell. Precostal on hind wing. Both cells very small.





WOOD WHITE

SINAPIS

WOOD WHITE

Leptidea sinapis

Habitat. Europe, except the Arctic, and Asia to Japan. Here, resident, very locally in many parts of England (particularly the west) and in SW. Ireland. Not in Scotland.

Haunts. Woodland clearings, rides, and sheltered wood edges.

Description. **Larva.** Cylindrical, tapering towards the tail, the last segment having a flap which covers the hindmost legs. Bright green, marked darker and yellow.

Food-plant. The bitter vetch (*Orobus tuberosus*) and also several other leguminous plants such as sweet pea, garden pea, the everlasting pea, the tufted vetch, the meadow vetchling, and bird's-foot trefoil.

Pupa. Beaked and pointed at both ends. Pale green, the tip turning reddish.

Butterfly. The sexes differ in shape, the fore wing of the male being narrower and more pointed: and usually in colouring, the fore wing-tip of the female being less dark (often reduced to a mere pale grey set of streaks along the nervures). There is also some seasonal difference between the spring and the summer broods. Those here figured are spring butterflies. The males in summer usually have the blotch smaller but blacker; whereas in the females it is both paler and smaller.

Varieties. Almost wholly in the depth and extent of the black wing corner. Females occur of pure unsullied white (Ab. ♀ *erysimi*). An albino is known, with buff marking instead of the usual black marking.



WOOD WHITE

Identification. Known from all other white Butterflies by small size, long body, wing-shape, and no black spot in mid fore wing.

Life cycle. Usually 1 generation a year (in some years 2), hibernating as Pupa.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----					Butterfly - Eggs-----	Larva-----					
							Pupa - Butfly Eggs-----				
and in certain years some:							Larva-----	Pupa-----			

Life history. The **Eggs** are laid singly on the under side of the leaves of the food plant and hatch in about 11 days. The **Larva** eats its way out of the egg and then eats a part of the eggshell. It eats by day only and lasts about a month, moulting 4 times. The specific name of *sinapis* (= mustard) seems to be based upon an error, as the Larvae of this species, unlike most of the other Pieridae, do not eat mustard, or indeed any other than leguminous plants of the pea family. The **Pupa** is attached by its tail-hooks to a pad of silk spun on the stem and by a silk band round its waist. It stands, tail down, in the position of a leaf which it greatly resembles. When there is to be a second generation, it lasts only 8 days, otherwise it remains over the winter.

The **Butterfly** is one of the slowest, feeblest, and

LEPTIDEA SINAPIS

most fluttering. It flaps about in the rides and clearings of woods, settling on the flowers of the bitter vetch. If enclosed in a collecting box, they beat their wings to pieces. Life about 15 days.

GENUS PIERIS Schrank

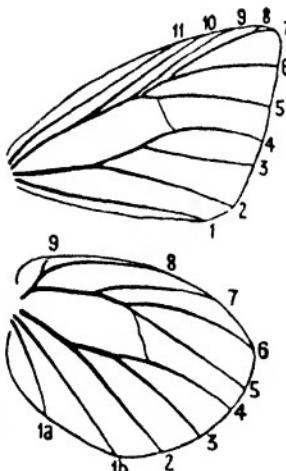
Three species, *brassicae*, *rapae*,
and *napi*

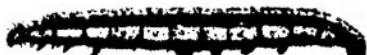
Some species gregarious, others solitary.

Larvae. Tubular, tapering slightly to both ends, long, downy, and granulated. Feeding almost wholly on Cruciferae.

Pupae. Angular, with a single point at the head. Girt.

Butterflies. Antennae long, ringed with black and white, and with marked clubs. Abdomens rather slender and short. Wing structure: the fore wings have 10 or 11 veins, No. 8 is hard to see and sometimes lacking. The hind wings have 9 or 10 veins—the precostal (No. 9) is lacking in *napi*. The cells, in both wings, are large and the cross-bars distinct.



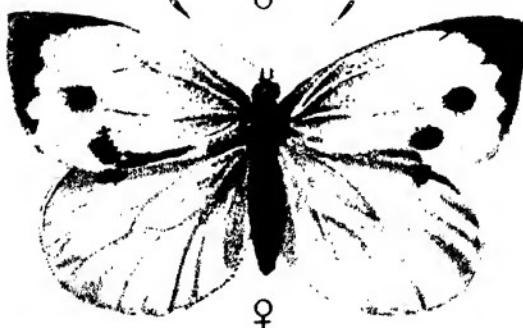


Larva ♂

Pupa



♂



♀

LARGE WHITE

BRASSICAE



LARGE WHITE

Pieris brassicae

Habitat. All Europe and most of Asia except the Arctic. Also N. Africa. Here resident everywhere except the Shetlands and also immigrant in vast numbers. After abundant immigration it is often reduced to comparative scarcity by ichneumon flies which destroy the larvae.

Haunts. Mainly cultivated ground, gardens, allotments, and vegetable crops.

Description. Larva. Short black and white hairs.

Food-plant. All cruciferous plants, such as cabbages, mustard, turnips, radishes, cresses, and nasturtiums or tropaeolums; also wild mignonette and dyer's weed. As this list covers most of our vegetables, this species is a serious menace to our food-supply.

Pupa. Varies much in colour, seeming to match its background.

Butterfly. Except in size (the female is usually considerably larger) the sexes differ only on the upper sides. Those here figured belong to the summer brood. There is a seasonal difference. Those of the spring brood have more white scales mixed with the black on the upper side, so that they seem greyer (less black) and underneath have more black scales dusting the hind wing, so that it looks darker.

Varieties are very minor.

Identification. Size distinguishes this from all the other 'whites', but if an unusually small specimen causes confusion, note the absence of green veining on the under side of the hind wing (in contrast with the Green Veined, *napi*) or of white and green dappling

LARGE WHITE

(in contrast with the ♀ Orange Tip, *cardamines*.) In contrast with the Small White, *rapae*, note that the male has no central black spot on the fore wing, while in *rapae* the male has almost always a central spot. The female has a black smear along the anal edge of the fore wing, while in *rapae* it is only a vague dark cloud along the edge. Both sexes have a large dark area at the tip of the fore wing which extends some way down the outer edge of the wing, but in *rapae* the dark tips to the wings are small and narrow.

Life cycle. Usually 2 generations a year, hibernating as Pupae. In unusually long and hot summers there are 3 generations. In addition, immigrants arrive at the end of May and the end of July.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----											
				Butterfly							
				Eggs--							
				Larva----							
				Pupa----							
				Butterfly							
				Eggs--							
				Larva----							
				Pupa-----							
				Butterfly							
				Eggs--							
				Larva----							
				Pupa-----							
and in long summers, sometimes:											

Life history. The Eggs are laid standing side by side in large batches of from 6 to 100 eggs on either side of the leaves of the food-plants. They hatch in from 4 to 17 days, according to the weather. The Larvae after emerging, eat the eggshell, and then

PIERIS BRASSICAE

spin a layer of silk over the leaf and begin to eat it. They feed gregariously and all together, beginning and stopping again as if by signal. They moult 4 times, ceasing to spin the web over the leaf after the last moult, and last in all about 30 days. When about to pupate those born in May or June often do so on the food-plant, but the later broods usually go to a tree trunk or to a wall, paling, or other woodwork, close to the food-plants. The Pupa is fastened by the tail-hooks to a pad of silk and by a girth of silk round the waist, and stands tail down if the support is vertical. It is more usually found lying horizontally on the under side of a ledge of wood, brick, or stone. It lasts about a fortnight, if not caught by the cold weather, in which case it remains dormant until the following spring. The Larvae have a nasty smell.

The **Butterfly** is perhaps our commonest, certainly our most conspicuous, species. It frequents both town and country, preferring fields of beans and clover or lucerne, and gardens. Its flight is fluttering and buoyant. It seems to choose white flowers on which to rest and particularly on which to spend the night. When migrating they can rest on the sea surface and rise again from it freely. An unusually large immigration occurred in 1937. Life about 25 days.



SMALL WHITE

Pieris rapae

Habitat. Europe and Asia to Japan and (by importation) throughout temperate N. America. Here, resident throughout the U.K. except the Shetlands and Hebrides. It is also, in certain years, e.g. 1937, an immigrant in vast hordes.

Haunts. Almost all kinds of country and also towns.

Description. Larva. Cylindrical, smaller only at 1st and last segments: pale green, darker above: a central yellow line and 2 side lines of pale dotted yellow: spiracles pink, outlined black: black dots all over, bearing pale hairs: head green.

Food-plants are the same as those of the Large White, *Brassicae*.

Pupa. Variable, taking the colour of whatever they rest on. May be cream, brown, grey, yellow, or green, with black markings.

Butterfly. The sexes differ in markings on the upper sides only. The females are usually yellower in colour.

There is a seasonal difference. The first (or spring) brood is much more faintly marked, the markings in the male are sometimes lacking altogether (*Ab. immaculata*). The females are more buff and sometimes the apical greyish blotch is lacking. The second (or summer) brood is here figured. When there is a third brood, the Butterflies are often small.

Varieties. Sometimes the female has the spots run together to form a band (*Ab. fasciata*). Very rare varieties have the ground colour clear yellow, or even dusky brown. ♂♀ exceedingly rare.



♀

SMALL WHITE

RAPAE

SMALL WHITE

Identification. See this heading under the Large White, *brassicae*.

Life cycle. Two generations a year, or in some warm years 3, hibernating as Pupae.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----											
				Butterfly--	Eggs	Larva					
					Pupa		Butterfly	Eggs	Larva		
								Pupa-----	Butterfly	Eggs	Larva-----
										Pupa-----	
and, in hot years, some:											

Life history. The Eggs are laid singly on the under side of a leaf, unlike those of *brassicae* which are laid in bulk. Generally only one egg is found on a leaf, but sometimes there may be several. They hatch in from 3 days to a week. The Larva first eats the egg-shell and then turns to the leaf where it feeds by day and night. It eats round holes in the leaf, which become larger as it grows. Although this species is by no means so gregarious as *brassicae*, for the first few moults it is unusual to find a Larva alone. It may, in this respect, be looked upon as half way between *brassicae* and *napi*. It moulted 4 times and pupates after 20 days. The Pupae found in June are very often on the food-plant leaves, while those of the later generations are more usually under ledges of buildings

PIERIS RAPAE

or fences. They are attached by tail-hooks and by a silk girdle. Those that do not hibernate last about 3 weeks.

The **Butterflies** are very like the last species in habits. They select white flowers for the night and for daytime rest. Although sometimes out as early as February, they do not usually emerge until April. Accounts of the big migrations ('like snowstorms') over land and sea are frequent and interesting. They spread all over the country. Like *brassicae* it is much victimized by ichneumons. Life about 20 days.



GREEN-VEINED WHITE

Pieris napi

Habitat. Europe and N. Africa, across Asia to Japan, the Canaries, Azores, and right across N. America. Here, resident throughout the U.K. up to Ross-shire, common but more local than its congeners. Also large immigrations.

Haunts. Particularly sunny wood-sides, lanes, marshes, damp meadows, and flowering fields of cruciferous plants. A rural species, rarely in gardens and unusually on cultivated ground.

Description. Larva. Lighter green than *rapae*, no central yellow line, spiracles black with yellow rings round them.

Food-plant. Cruciferae, but usually the wild varieties, such as charlock, garlic-mustard, winter-cress, watercress, cuckoo-flower, and hedge-mustard. In captivity it can be reared on wall-flower or nasturtiums.

Pupa. Varies in colour with its background and, being a rural species, is therefore more often green.

Butterfly. Sexes differ in marking as here seen. There is also a seasonal variation: the spring brood is usually more faintly, the summer brood more heavily, black marked. Those figured are summer butterflies.

Varieties. There is much normal variation in ground colour (which goes from pure white to pale drab) and in the marking (which may be light or heavy). It seems as though warmer, damper, climates produced the darker types in both respects. A yellow form, found chiefly in Ireland, is known as Ab. *flava*. Ab. ♀ *fasciata* has all the fore-wing markings run



GREEN-VEINED WHITE

NAPI

GREEN-VEINED WHITE

together. An unusually large form with faint veining on the under side is called Ab. *napaea*. Those of a pale drab colour (common in the Alps and recorded in Ireland and Scotland) are known as Ab. ♀ *bryoniae*. ♂ ♀ specimens are very rare.

Identification. The green veining on the under side distinguishes from all others.

Life cycle. Two generations a year (the 2nd only partial) hibernating as a Pupa.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa - - -											
			Butterfly - Eggs - Larva -- and some:								

								Butterfly Eggs - Larva -- Pupa - - -			
--	--	--	--	--	--	--	--	---	--	--	--

Life history. The Eggs are laid singly under the leaves and on the young shoots of the food-plants, and hatch in about 5 days. The Larva, like all other caterpillars born from eggs laid singly, is solitary throughout its life, and shows no inclination to the sociability which is so marked a character of the Large White, *brassicae*. It has an odd gliding motion, swinging the head as it moves. It feeds by day and night, moult 4 times, and pupates in about 18 days. These Larvae are no such pests as those of the other *Pierides*, the food-plants being mainly wild and not garden vegetables or crops. The Pupa is found on palings and

PIERIS NAPI

buildings, but far more often on plants, attached by the tail-hooks and a silk girdle.

The **Butterflies** are in most respects similar to the Large Whites, *brassicae*, and Small Whites, *rapae*, in company with which they have been seen migrating. Life 15–20 days.

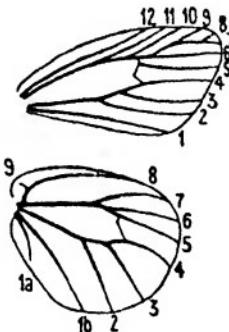
GENUS EUCHLOE Hübner

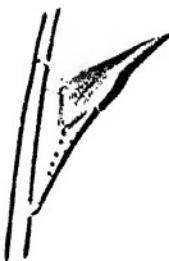
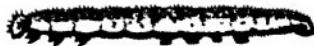
One species, *cardamines*

Larva. Small and downy, tapering, solitary, and feeding on Cruciferae.

Pupa. Differs greatly in shape from those of *Pieris*.

Butterfly. Antennae short, with flattened oval clubs. The orange tip of the males is absent in some foreign species. Wing structure: the front wings have 12 veins, of which Nos. 6–9 branch from one stem after leaving the (large) cells. The hind wings have a precostal vein (No. 9). The cross-bars on both wings are distinct and bend at a sharp angle.





♂



♂



♀



♀

ORANGE TIP

CARDAMINES



ORANGE TIP

Euchloë cardamines

Habitat. Europe and across Asia to China. Here, resident throughout U.K. up to Morayshire, but uncommon in Scotland.

Haunts. Waysides and lanes, hedgerows, woodsides, and damp meadows.

Description. *Larva.* Green shading to blue and then white at the sides; spiracles white; bristles black but white on the white lines.

Food-plant. Various cruciferous plants, particularly garlic-mustard, cuckoo-flower, hedge-mustard, winter-cress, and garden-honesty (*Lunaria biennis*); also horse-radish

(*Cochlearia armoracia*) and watercress.

Pupa. Long, pointed and like a seed-pod. It changes colour, the general appearance being by turns green, buff, and pinkish brown. Some stay green.

Butterfly. More than usually variable in size. The females lack all orange. The orange colour may be almost yellow.

Varieties. They vary very little. There are sometimes faint discal spots of black on the hind wings of both sexes and the front-wing spot of the female varies in size. Dwarf specimens are recorded (Ab. *hesperidis*) in which the orange tip of the male is somewhat smaller than usual. A true albino is known (Ab. *lasthenia*) having no black but all the orange being unaffected. Complete half and half ♀ ♂ specimens have been taken, also females having splashes of orange.

Identification. The male is unmistakable. *Cardamines* alone of our Butterflies has the green-mottled

ORANGE TIP

under hind wing. The only possible confusion would be between the female and the Bath White, *daplidice* (see p. 322), which is so rare that it may be neglected.

Life cycle. Almost always 1 generation a year, hibernating as Pupa. One, possibly 2, exceptions to the rule have been noted (1) At least one pupa has been known to remain dormant over two successive winters. (2?) Also butterflies sometimes emerge in July, August, or even September. Such may be retarded individuals or, possibly, a partial second generation.

TIME-TABLE :

Life history. The Eggs are laid singly at the base or stalk of a flower, and last about a week. The Larva first eats the eggshell (and, with contents, any other eggs it may find!) and then turns to the young seed-pods. It feeds by day, on buds, flowers, and leaves, as well as on the seed-pods, moults 4 times and lasts about 25 days. It is a cannibal during the early stages. Some time before pupating it leaves the food-plant and wanders off to seek a place for pupation. The Pupa, in spite of its great likeness to the seed-pods of the food-plants, seems very rarely to be found

EUCHLOË CARDAMINES

upon them, but rather upon the twigs of some more enduring plant, in hedge or elsewhere. It stands, leaf-like, fastened to the twig by the tail-hooks and a silk girdle.

The Butterflies fly and behave much as do the other Whites. When resting with closed wings, the fore wings almost covered by the hind, on the green and white flowers of hedge-parsley or garlic-mustard they become practically invisible—a striking instance of nature's most perfect camouflage. Life about 18 days.

GENUS *COLIAS* Fabricius

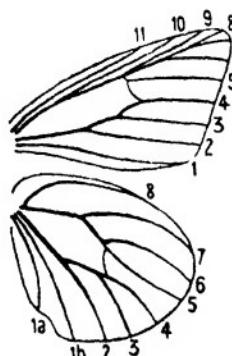
One species *croceus* (and *hyale*,
see Appendix)

Solitary as Larvae, migrants.

Larva. Smooth, slightly downy. Feeding on Leguminosae.

Pupa. Straight, ending in a point at the head. Girt.

Butterfly. Antennae, short, thick, swelling to a blunt-ended, and not flattened, club, which is always red. Eyes rather prominent. Palpi close together and compressed. Abdomen stout and shorter than the wings. The fore wings have 11 veins, of which Nos. 6-9 branch from one stem just beyond the cell. No precostal vein on the hind wing.





CLOUDED YELLOW

CROCEUS

CLOUDED YELLOW

Colias croceus

Habitat. Mediterranean basin, W. Asia, and Iran. Here, merely a migrant, as it cannot survive our winter climate. It migrates on a large scale from the Mediterranean to the whole of central and W. Europe and, probably, reaches this country every year. The immigration here is irregular and sometimes in large numbers. There were 9 such years in the 19th century, and since then the chief *croceus* years have been 1900, 1901, 1913, 1928, 1933, and 1938. There is some evidence of a return (southwards) migration in the autumn.

Haunts. Rough flowery ground, clover and lucerne fields. It is useless to attempt a distribution chart. They arrive along our southern coasts and spread, in diminishing numbers, all over these islands. In 1877 they were found everywhere except in the Shetlands.

Description. Larva. Covered with tiny white hairs, each coming from a black wart.

Food-plant. Leguminous plants, mainly clover and lucerne.

Pupa has, on the abdomen, a row of black dots and beneath it another of purple blotches.

The Butterfly varies much. Those here figured are bright and full coloured.

Varieties. The colour varies, in extreme cases, from white (in the ♀) to the rich yellow of the figures. There are also differences in the extent of the black markings and in the number (or even absence) of the yellow spots on the band bordering the fore wing of the female. There is a fairly frequent form of the female (Ab. ♀ *helice*) in which the colour is a pale yellow matching that of the Pale Clouded Yellow, *hyale* (see p. 324). Other females are known (Ab. ♀ *pallida*) which are almost or quite white.

Identification. The normal form is unlike anything else. The only possible error is between the ♀ *helice* and *hyale*. The black markings differ. Comparing

CLOUDED YELLOW

the 2 plates (on p. 268 and on p. 325) it will be seen that in *croceus* the black border of the fore wing extends farther (to and beyond the corner touching the hind wing), and the black border of the hind wing is both broader and heavier.

Life cycle. At its home in S. Europe it breeds all through the year, summer and winter. Here, at most, it breeds once, on arrival, the British born insects and their offspring dying off when autumn sets in. It is possible that, in the warmest places here, some may have survived the winter, but as yet there is no evidence of this.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
				Butterfly Immigrnt Eggs --- Larva ----- Pupa ----- Butterfly. Eggs. Larv.							

Life history. The Eggs (some 500 in number) are laid singly on the top of the leaves and hatch in about a week. The Larva first eats most of its eggshell and then feeds, by day and mainly in the sun, on the upper side of the leaf, not piercing it until after the 1st moult. It moults 4 times and lasts about 31 days. The Pupa is fastened by the tail-hooks and a silk girth to a leaf or stem of the food-plant or elsewhere near the ground.

The Butterflies are swift and powerful fliers.

COLIAS CROCEUS

They have been seen on migration, flying so low over the sea as to have to rise to clear the waves, and have been recorded as staying for 3 weeks by the coast where they landed (in Cornwall). They are said particularly to frequent yellow composite flowers. Life probably about a month.

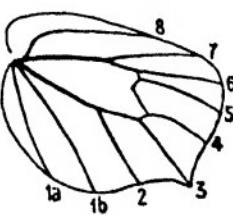
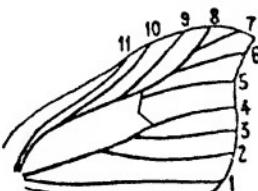
GENUS GONEPTERYX Leach

One species, *rhamni*

Differs from *Colias* as follows:

Pupa. Differently shaped, having large bulging wing cases.

Butterfly. The bodies are covered with long hairy down. The shape of the wings is quite distinctive, with its gothic curves. There is no evidence of migration. Food-plant is distinctive.





BRIMSTONE

Gonepteryx rhamni

Habitat. N. Europe and Asia, except the Arctic. Here, a common resident in England and Wales, becoming rare northwards. Not in Scotland. In Ireland, locally in the SW.

Haunts. Woods, clover fields, and waysides.

Description. Larva. Covered with tubercles, each with a minute black hair.

Food-plant. Only one or other of the two buckthorns; the alder-buckthorn or the buckthorn.

Pupa. Shortly before emergence, a difference between the sexes appears. The male Pupae become brilliant yellow with scarlet marginal spots on the wings and antennae.

Butterfly. The curved, 'gothic', wing is unique among our species. There is long greenish-white silky hair on the body. The females may be as here figured, or may be less green and more pale yellow.

Varieties are few. Very rarely the males have an orange blotch covering most of the fore wing, resembling a continental species—*G. cleopatra*. A few more or less ♂ ♀ specimens have been found, and also a few aberrations with numerous brownish spots on the wings. All aberrations are, however, very rare.

Life cycle. One generation a year, hibernating as a Butterfly.



BRIMSTONE

RHAMNI

BRIMSTONE

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Butterfly											
					Eggs	Larva	Pupa	Butterfly			

Life history. The **Eggs** are laid, singly, under a young leaf, or sometimes on a young stem, and hatch in about 10 days. The **Larva** lies along the upper side of the midrib of a leaf and eats through the leaf. When ready to pupate, after 4 moults and in about a month, it leaves the food-plant and goes to a neighbouring plant (bramble recorded) where the **Pupa** is found suspended by the tail-hooks and girt with a silk thread. The Pupa lasts about a fortnight.

The **Butterfly** has the unusual habit of seeming to prefer to visit flowers of the contrasting colour of pink or purple, such as brambles, scabious, knapweed, and clover. On primroses, daffodils, or dandelions it becomes almost invisible. They seem to be comparatively inactive and slow after first emerging and until they hibernate, which they soon do, choosing for the purpose evergreens, such as ivy or holly, where they settle on the under side of the leaves and become very difficult to see. On warm autumn days, however, they come out for short flights in the sunshine. In March (or even in February, if warm) they come out from their winter sleep and take up the normal life of flight, courtship, and flower sipping, and may be found living on until the end of July, after the emer-

GONEPTERYX RHAMNI

gence of the next year's brood. They may thus live as Butterflies all through the twelve months.

FAMILY PAPILIONIDAE SWALLOW-TAILS

This family contains the Swallow-tails and others which have all six legs fully formed and used for walking, and have only one anal vein on the hind wings, which are concave along the body, so as to leave it uncovered.

Of this large, and widespread family, we have only one species, so that the family characters will be given with those of the only British genus:

GENUS PAPILIO L

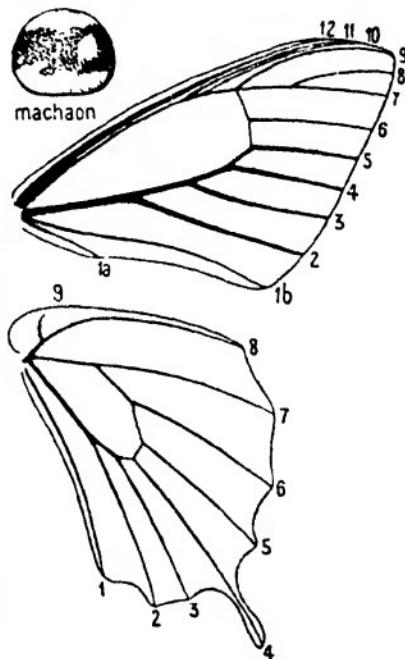
One species, *machaon*

Eggs. Spherical, slightly flattened at the base, smooth, yellow, becoming marked with brownish purple.

Larva. Tubular, hairless, having only very minute bristles. There are no spines, but, on the 1st segment, a retractile organ, forming two horns and emitting a strong scent when thrust out.

Pupa. Angular, with 2 points at the head. Girt.

Butterfly. Antennae with long clubs, curved upwards. Head large, eyes round, prominent and smooth. Wing shape and structure as shown. The (single) anal vein of the hind wing runs along the concave hinder edge of the wing.



SWALLOW TAIL

Papilio machaon



Habitat. All Europe (except the Arctic), Syria, Egypt, and N. Africa. Also N. and E. Asia, India, and China. Here, a very local resident in the fen districts of Cambridgeshire, Hunts, Norfolk, and Suffolk. Having become almost extinct, recently it has increased in numbers, since protection has been afforded to it in Wicken Fen.

Description. Larva. Has 2 retractile orange 'horns', erected only if it is alarmed. This action produces a strong smell of 'ripe pineapple'.

Food-plant. Here, in the fens, milk-parsley (*Paeonia palustre*),

wild angelica, wild carrot, and other members of the parsley family. Abroad it is not so restricted, and it will eat garden carrots and garden fennel.

Pupa has 2 horns on the head and varies much in colour—from greenish yellow, little marked, to the tint here figured and again to a very dark brown.

Butterfly. The male is here figured. The female is similar but larger. Some have red in the half-moon-shaped marks round the margins, particularly on the hind wings near the fore wings.

Varieties. Slight, mainly in the width of the margins and other black markings. The space between the discal cell and the marginal band is sometimes wholly black. Our English specimens are generally more heavily marked than those from the Continent and some few have been taken with much heavier black markings. In some, the ground colour is browner.

Life cycle. One generation a year, and, usually, a



SWALLOW-TAIL

MACHAON

SWALLOW TAIL

partial second. Hibernates as Pupa. There are records of Pupae remaining as such over a second winter, so that 1 generation lives 2 years.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa	-----	-----	-----	-----	-----	(Has remained over till next year)					
						Buttly					
						Eggs	---				
						Larva	--				
Some hibernating: while others emerge as:						Pupa	-----				
							Butterfly				
							Eggs	---			
							Larva	--			
							Pupa	-----			

Life history. The Eggs are laid singly, one on each plant (unless in error by several mothers) on the under surface of the leaves, and hatch in from 8 to 10 days. The Larva eats the eggshell before turning to the food-plant. It is solitary, feeds in the sunlight, moults 4 times and lasts about 30 days. When frightened, it erects the soft, scented, horns shown in the figure. The Pupa is attached, head up, to a reed or a stem of the food-plant, by the tail-hooks and a silk girdle. Those that do not hibernate last about 3 weeks, while the majority remain until the spring, and some, sometimes, over 2 winters.

The *Butterfly* was at one time commoner than it is now, and has been recorded in most of the southern counties. But for many years it has been restricted to the habitat described. Since the practice of breeding Butterflies and 'putting them down' has become common, it is in less danger of extinction and stray specimens are found in unexpected places. Abroad,

PAPILIO MACHAON

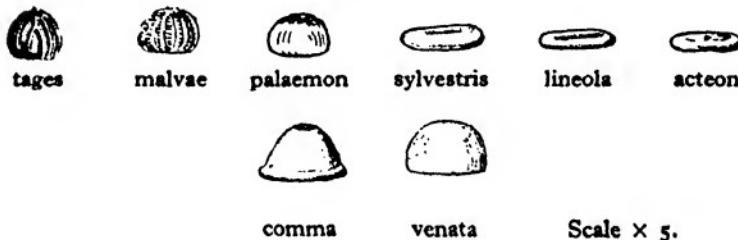
they are not confined to low or marshy land. They are considered 'fastidious', sometimes not flying even on fine days. Its flight is not swift but somewhat feebly flapping, and its broken colours make it less visible than would be expected from its size. Life about a month.

FAMILY HESPERIIDAE

SKIPERS

A large family of several thousand species, mainly South American. There are about 30 European species of which we have 8, all small brown or grey Butterflies, in many ways resembling Moths.

The Eggs of our species differ very much in shape.



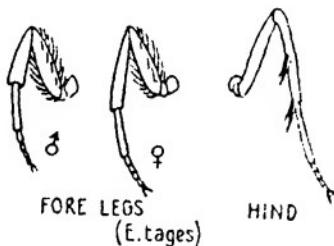
Except those of *tages* (red) and *malvae* (green) they are all yellow or orange.

The Larvae of all genera represented here have large round heads with small thin necks. They taper at both ends and are smooth or have very minute down or hairs. They have the moth-like habit of living in hiding, rolling themselves up in leaves or blades of grass spun together, or under a silk web. They feed on grasses or small plants.

SKIPPER S

The Pupae are long and tapering, without projections, and are not suspended but usually wrapped in loosely spun cocoons.

The Butterflies are small, with relatively large bodies and still larger heads. The eyes are smooth, round, and prominent, and there is an 'eyebrow' of long hairs at the base of the antennae. The antennae are short, with thick, and often curved, clubs which, in one of our species, end in slender hooks. The palpi vary much; the first two joints being usually hairy and the 3rd sometimes stretched out forwards and sometimes cocked up. All six legs are fully



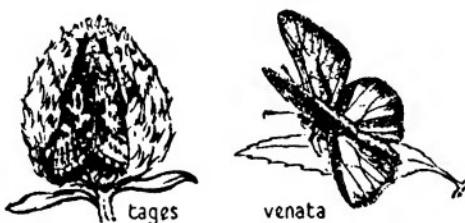
developed in both sexes, though the fore legs of the males are slightly shorter than those of the females, and all ours have 4 spurs on the hind shins except *Carterocephalus* which has only 2. In addition to the spines, some species have tufts of long hair on the hind shins of the males.

The wing structure is peculiar. Of the 12 veins in the fore wing, none branches after leaving the cell. In the hind wing, there are usually 9, but in both wings No. 5 and the cross bars are often weak or even missing.

In flight and posture they differ from other Butter-

HESPERIIDAE

flies. The name Skipper comes from their swift, short, darting flight, and several of them assume resting positions more suggestive of moths than of other Butterflies.



GENUS ERYNNIS Schrank

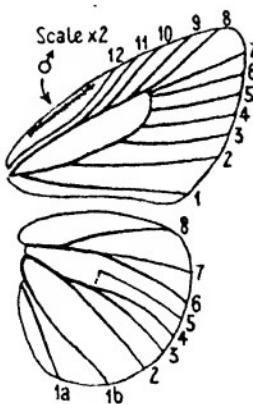
One species, *tages*

Eggs. Domed and fluted.

Larva. Downy, with anal comb; not a grass feeder.

Pupa. Lying in a loose cocoon.

Butterfly. Antennae about half length of wings, with a long, slightly curved club without hook. Palpi thrust forward, first 2 joints hairy, 3rd bare and conical. Hind shins have 2 pairs of spurs and no tufts of hair. Wing structure as shown. Note: hind wing rounded. In the fore wing No. 5 starts midway between Nos. 4 and 6. Male has a pleat along the fore edge of fore wing.





DINGY SKIPPER

TAGES

DINGY SKIPPER

Erynnis tages

Habitat. All Europe, W. Asia, and Amurland, except the Arctic. Here, a common resident throughout England and Wales, commonest on the chalk and limestone soils. In Scotland, very local up to Ross. In Ireland, local but common in Clare, Fermanagh, and Galway.

Haunts. Open spaces, rough ground, hill-sides, meadows, heaths, and wood-sides.

Description. Larva. Covered with tiny white hairs growing from black dots. There is a fan-shaped comb over the vent, with which the excreta are thrown to a distance.

Food-plant. Bird's-foot trefoil only.

Pupa has amber tail-hooks and a small brush of black bristles on the 1st spiracle.

Butterfly. Antennae short, clubs long, blunt, and not hooked at the end. The sexes are alike in pattern and colour. The actual male and female figured show normal variations in colour common to both sexes. The sexes are distinguished by the male having the costal edge of the fore wing folded back so as to make a pleat half-way along the edge of the wing, which shows as a dark line. Inside this fold are scent-scales.

Varieties. There are many minor varieties, and those of the second brood, when there is one, are generally lighter in colour, especially on the under side.

Identification. Note (in contrast to the Grizzled Skipper, *makvaee*, which alone bears a general resemblance) the fringes, the more indeterminate and



DINGY SKIPPER

browner marking above, and the quite different under side.

Life cycle. One generation a year, hibernating as fully grown Larvae. In long warm summers in the south, a partial second generation appears.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva			Pupa	Butterfly	Eggs	Larva					
Sometimes, in warm years, some: and possibly (?):						Pupae		Bufly	Eggs	Larva	

Life history. The Eggs are laid singly, one on each plant, on the small sprouting leaves, and last from 9-12 days. The Larva eats enough of the eggshell to get out at the top, but no more. It then spins a few leaves together and lives inside the tent so made, feeding by night and day, and moving (by night) when it has perforated the leaves to another such tent. It is full grown after 4 moults (usually about mid-August) and then, in the same way, spins up a more elaborate, cocoon-like tent and settles down to hibernate till April or May, when it pupates where it is. The Pupa lasts some 30-35 days.

The Butterfly usually emerges in May-June (in hot years sometimes in April) and is active and quick moving. Its flight, like that of other Skippers, is very swift and short, darting from place to place, low over the ground, except when it rises to chase another

ERYNNIS TAGES

insect, and it often rests on the ground or on low herbage. It rarely sips flowers, but, when settling down for the night, or in dull weather, chooses flowers such as dead knapweed heads, thistles, or grass heads. The resting position is then that of a noctuid moth rather than of a Butterfly: head bowed forward, wings laid along the body, the fore wings (with upper surface showing) completely covering the hind wings, and the antennae laid back along the costal edges of the fore wings. (See sketch on p. 281.) When poised for a moment the wings are laid horizontally, not, as are those of most Butterflies, with the upper sides together. It lives about 20 days.

GENUS PYRGUS Hübner

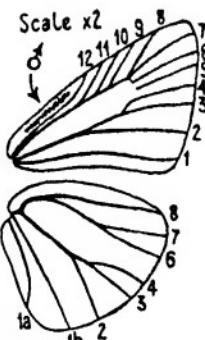
One species, *malvae*

Eggs. Domed and fluted.

Larva. Downy, with anal comb; not a grass feeder.

Pupa. Bristly, in loose cocoon.

Butterfly. Antennae much as those of *Erynnis*. Palpi with 3rd joint thin and erect. Hind shins with 2 pairs of spurs and (males only) tufts of long hair. Wing structure as shown. Note: hind wings rounded and larger than usual in Skippers. In fore wing No. 5 midway between 4 and 6. Both cross-bars, and No. 5 of hind wing, are lacking. Male has a pleat along the fore edge of the fore wing.





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♀

GRIZZLED SKIPPER

MALVAE



GRIZZLED SKIPPER

Pyrgus malvae

Habitat. Most of Europe, Cyprus, Asia Minor, and part of N. Asia. Here, resident and common but rather local in England and Wales. In Scotland, rare and local. Not in Ireland(?)

Haunts. Dry open places in woods, meadows, and rough ground.

Description. Larva. Covered with tiny white hairs on tubercles: a fan-shaped comb over the tail for rejecting the excreta.

Food-plant. The wild strawberry, silverweed, bramble, raspberry, and agrimony.

Pupa. Covered all over, except the wings, with orange bristles.

Butterfly. Antennae short, clubs long, blunt and not hooked. There is little or no difference between the sexes except that the males have folds in the fore wings (as *tages*) with scent-scales. These folds show as tiny white lines. The males have also, alone, tufts of hair at the base of the shins of the hind legs. Both sexes vary from dark grey to almost black and white. Usually, perhaps, the female is the darker.

Varieties. There is a good deal of variation in the extent of the white marking. When these marks are run together in a band across the front wing the variety has been named *Ab. taras*. Sometimes the hind wing is almost wholly black. The colour of the under sides varies from buff to dark brown.

Identification. See this heading under *tages*, p. 283, and in this species note the 'runged' fringes.

GRIZZLED SKIPPER

Life cycle. One generation a year, hibernating as Pupa. In very exceptional years, there is a partial 2nd generation, which is usual in warmer climates.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Pupa-----				Butterfly - Eggs----- Larva-----			Pupa-----	Butterfly Eggs----- Larva-----			Pupa-----
				and, exceptionally, some:							

Life history. The **Eggs** are laid singly on the upper sides of the leaves and hatch in from 8 to 10 days. The **Larva**, on emerging from the egg, spins a silk covering for itself over and along the midrib of a leaf, coming out, by day, to feed and returning to its shelter. After the 2nd moult it draws the leaf-edges together and so forms a tent. After the 4th and last moult, it still lives in a similar leafy tent and, after about 60 days, spins a loose, but definite, cocoon (made up of leaves, as before) in which to pupate. This is usually down among the lower stems of the plant. The **Pupa** is attached by its bristles to the threads of the cocoon.

The **Butterfly** is unusually swift and spasmodic in flight, settling often on the ground, with wings horizontal, to bask in the sun. In dull weather or at night they rest, on plantain or grass heads, with the wings, like those of most butterflies, closed with the upper sides together and with the fore wings almost

PYRGUS MALVAE

covered by the hind wings. They do not seem to visit flowers, but often dart off to attack others of the same or other species. Life about 15 days.

GENUS CARTERO-CEPHALUS Lederer

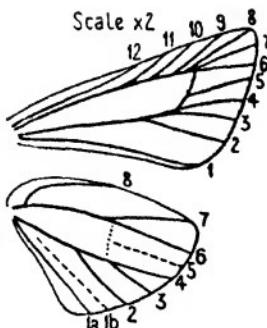
One species, *palaemon*

Eggs. Globes with faint network.

Larva with anal comb, lives in a spun tube of grass.

Pupa. Girt with silk in a tent of grass blades.

Butterfly. Head unusually broad and eyes prominent. Antennae short (less than half the wings), with clubs long, thick, and sharp-ended. Palpi wide apart, hairy: 3rd joint thin, pointed, and sloped up. Hind shins have only 2 spurs and sparse hairs. In wing structure, note: fore wing, with long cell and No. 5 starting near No. 4; hind wing, rounded, Nos. 1b, 5, and the cross-bar very faint. The males have no distinctive fold with scent-scales.





CHEQUERED SKIPPER

Carterocephalus palaemon

Habitat. Local in central Europe, Finland, central and S. Russia, Dalmatia, Piedmont, Armenia, S. Siberia, and the Amur. Here resident and very local in some of the eastern midland counties of England only.

Haunts. The wider rides or rough roadways in woods.

Description. **Larva.** Changes much in colouring during its life, even during hibernation. As here figured after hibernation, in spring. It has a tail comb which throws the excrement to a distance of over a foot.

Food-plant. Grasses, usually false brome-grass, and hairy brome-grass (*Bromus asper*).

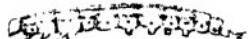
Pupa. Smooth, with the appearance of dry grass, and having long tail-hooks.

Butterfly. The clubs of the antennae end in points, but not hooked. The sexes are much alike, the female being slightly larger and her yellow markings paler.

Varieties. Fairly numerous, consisting in the yellow markings being either more or less in number and size than is usual.

Identification. There are two Butterflies with which this species might be confused.

A. The female Silver-Spotted Skipper, *comma*. As to this, note that *palaemon* (1) is distinctly smaller and has more pointed wings, (2) has rounded hind wings with no indentation near the hind angle, (3) has the yellow 'chequers' more numerous and smaller, and (4) has no white on the under side.



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♀

CHEQUERED SKIPPER *PALAEON*

CHEQUERED SKIPPER

B. The Duke of Burgundy Fritillary, *lucina*. As to this note that *palaemon* (1) has the large head, wide-spread antennae, 'eyebrows', and large body common to the Skippers and (2) no black dots in any yellow space on either side.

Life cycle. One generation a year, hibernating as full fed larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva			Pupa		Butterfly						
					Eggs						
					Larva						

Life history. The Eggs are laid singly on the grass blades and hatch in 10 days. The Larva after emergence eats the extreme edges of the grass blade and then fastens the edges together with a few ropes of stranded silk which shrink and bring the edges close, making a tube. It feeds on the grass both above and below the tube until only the short tube is left on the midrib, when it moves to another blade and does the same there. It feeds by night and day and is solitary. By about mid-October, after its 4th and last moult, it makes a larger tube, by fastening the edges of 2 blades together, in which it hibernates till March. After hibernation it does not feed any more and, early in April, spins 5 or 6 blades together as a tent in which the Pupa stands, girt with a silken belt. The Pupa lasts about 6 weeks.

The Butterfly moves in short and extremely swift

CARTEROCEPHALUS PALAEMON

darts from flower to flower of the bugle, which it chiefly affects, and basks, with outspread wings on the grasses. When resting, the wings are held half open. Life about 2-3 weeks.

GENUS ADOPOEAE Billberg

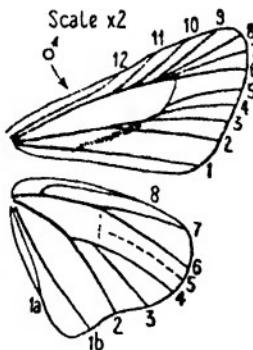
Three species, *sylvestris*, *lineola*, and *acteon*

Eggs. Long lozenge-shaped.

Larvae with white wax under hinder segments and anal combs, live in spun tubes of grass.

Pupae. Girt with silk in a tent of grass blades. The tongue case is long and detached from the body.

Butterflies. Heads not very broad. Antennae short and not hooked. Palpi with long hair on 2nd joints, 3rd joints long, thin, and almost erect. Hind shins have 4 spurs. Abdomen thin and long, extending beyond the wings. In wing structure, note: fore wing, No. 5 starts close to No. 4. Hind wing is slightly concave and No. 5 and the cross-bar are faint. The males have a distinctive fold with scent-scales.





SMALL SKIPPER

Adopoea sylvestris

Habitat. Most of Europe, the Canaries, N. Africa, Asia Minor, Syria, Armenia, and N. America. Here, resident, local but common in most parts of England and Wales. Not in Scotland and rarely recorded from S. Ireland.

Haunts. Rough ground, waysides, and the edges and clearings of woods, marshes, and coastal sandhills.

Description. Larva. Has a comb which throws the excreta to a distance. The tail ends in a flap and there is a patch of white wax under the 9th-11th segments.

Food-plant. The softer and longer grasses, as cat's-tail, soft-grass, Yorkshire fog, and heath brome-grass (*Brachypodium pinnatum*).

Pupa has a beak on the head, and has tail-hooks.

Butterfly. The antennae are not hooked and are black on the upper side and yellow on the under side, the extreme tip being reddish. The sexes differ, the male having a line of black scent-scales diagonally crossing the fore wings, which is absent in the females.

Varieties are very rare. Sometimes the colour is pale, being straw coloured or even almost white (Ab. *pallida*) and a form of a dull olive shade, except in the centre of the fore wing, has been found in the New Forest. One ♂ ♀ has been taken.

Identification. The males of the Lulworth Skipper, *actaeon*, are of a different, browner, colour. So much does the adult Butterfly of *sylvestris* resemble the Essex Skipper, *lineola*, that it was not until 1890 that the latter (though not rare) was detected as a different



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×3

SMALL SKIPPER

SYLVESTRIS

SMALL SKIPPER

species. (1) The under sides of the antennae (see figures on pp. 295 and 298) give the only trustworthy difference. They are yellow without black tip in *sylvestris*, black-tipped in *lineola*. The upper sides are black in both species. Other differences, harder to detect, are (2) the male's scent-scale mark in *sylvestris* runs across the 1st vein, while in *lineola* it is shorter, less thick, and more parallel to the veins, and (3) the shape of the fore wings is said to differ slightly, being more rounded in *lineola*.

Life cycle. One generation a year, hibernating as newly born Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva-----					Pupa-----						
					Butterfly		Eggs	Larva-----			

Life history. The **Eggs** are laid in batches of 3-5 eggs, inside the outer sheath-leaf of the grass stems, and hatch in 23 days. The **Larvae** first eat the whole of the eggshell except the base and then, at once, spin themselves complete cocoons of white silk, inside the sheath-leaf where they are and thus remain hibernating until the spring. In mid-April they wake up and each eats its way out of its cocoon and begins to feed on the grass. After 2 or 3 meals, it sews together the edges of a blade to form a tube in which it lies. It lives alone and feeds by day and night. It moults 4 times and then spins several blades together, making

ADOPOEA SYLVESTRIS

a tube in which the **Pupa** is found standing fastened by the tail-hooks and a silk girdle. It lasts 12-17 days.

The **Butterfly** resorts to damp places, though not found in the fenlands. It flies in short, quick-beating, jerks from one resting place to another. It visits many flowers, particularly knapweed and thistles, and more especially the welted thistle, *Carduus acanthoides*. When basking in the sun it adopts an attitude characteristic of this genus and of *Ochlodes*: the fore wings raised and slightly open, the hind wings fully open and flat. See sketch of *venata* on p. 281. Life about 20 days.



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X3

ESSEX SKIPPER

LINEOLA

ESSEX SKIPPER

Adopoea lineola

Habitat. Most of Europe and Asia, except the Arctic, and the Canaries. Here, resident, discovered in 1890 and, so far, recorded from the SE. counties of England only, but possibly much more widely distributed.

Haunts. Much as those of *sylvestris*, rough ground, sea walls, and marsh dykes, clover, and lucerne fields.

Description. Larva. More cylindrical and rather less yellow than that of *sylvestris*. It also has the comb at the tail and the white wax under the 9th-11th segments.

Food-plant. The longer and coarser grasses, particularly couch-heath brome-grass (*Brachypodium pinnatum*).

Pupa has a longer beak than that of *sylvestris*, which, in *lineola*, is equipped, like the tail, with hooks.

Butterfly. Closely resembles *sylvestris*. The antennae are not hooked and on the under sides (see enlargement opposite) are orange yellow with the tip-ends black, for about one third of the club: the upper sides are black. The scent-scale mark of the males is shorter, more parallel to the veins of the wing and generally less distinct.

Varieties are slight, mainly in the tone of the colour, which may be as pale as straw, and in the width and intensity of the dark margins.

Identification. The great difficulty is to distinguish this species from the Small Skipper, *sylvestris*. The only sure test is that the under sides of the antennae of *lineola* show some black, whereas those of *sylvestris*



ESSEX SKIPPER

are orange-yellow throughout their length. Compare the enlargements opposite pages 294 and 299. In both species the upper sides of the antennae are black. For other differences see this heading under *sylvestris*, on p. 294. The similarity is so great that, although this species is locally quite common, it was not distinguished, or known to exist in this country, until 1890.

Life cycle. One generation a year, hibernating as Egg. Note that this differs from *sylvestris*.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----		Pupa-----	Butterfly	Eggs-----				

Life history. The Eggs are laid in a row inside the outer leaf-sheath of the grasses and do not hatch until the following April. The Larva eats a hole in the end of the egg and emerges. It feeds by day and night, and, when fully grown, after the 4th moult, spins a loose net of silk round some grass blades. It then spins a layer of silk on the blade upon which it rests, head up, and also a girdle of silk round its middle. Thus it remains for some 3 days before pupating, having lived as a Larva for about 60 days. The Pupa is attached by the head and tail-hooks as well as by the girdle, and it lasts about 23 days.

The Butterfly behaves as does *sylvestris*, with which it is usually in company, flying in short, swift, sudden jerks, from flower to flower, particularly

ADOPOEA LINEOLA

knapweeds, thistles, clover, and lucerne. It rests at night and in dull weather on the heads of grasses or flowers with the wings vertical and closed. In the sun, it basks with the fore wings partly open and the hind wings expanded horizontally and flat. Life probably 18-20 days.



LULWORTH SKIPPER

ACTEON

LULWORTH SKIPPER

Adopoea acteon



Habitat. Most of central and S. Europe, NW. Africa, and Asia Minor. Not confined to the coasts. Here, resident and very local, being found only in the coastal districts of SW. England.

Haunts. The southern slopes of cliffs and hill-sides bordering the coasts of Dorset, Devon, and Cornwall.

Description. Larva. With a projecting flap over the tail where there is also a comb for ejecting the excreta. There are the same patches of white wax under the 9th-11th segments as in the other members of the genus.

The whole surface is covered with minute white bristles.

Food-plant. Grasses, mainly heath brome-grass (*Brachypodium pinnatum*), but also annual meadow-grass, cat's-tail, soft-grass, and false brome-grass.

Pupa, with beak very long. No hooks except at the tail.

Butterfly. The antennae are black above and underneath cream-coloured, becoming redder towards the tip. The sexes differ, the male having a scent-scale mark like that of the last 2 species, and the female the brighter yellow 'peacock's feather' marks on the fore wing. Sometimes the males show more or less indication of these peacock's eyes. The under sides also differ.

Varieties. The colour of both sexes varies slightly, but is always darker, duller, and browner than *sylvestris* or *lineola*. One ♂ ♀ is on record.

Identification. The peacock's eyes distinguish the females and some males from all other Skippers.

LULWORTH SKIPPER

Where the male has no sign of this, its darker colour must be relied on to distinguish it from the Small Skipper, *sylvestris*.

Life cycle. One generation a year, hibernating as new-born Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva						Pupa- Butterfly	Eggs-	Larva			

Life history. The Eggs are laid in the outer leaf-sheath of the grass, in rows, sometimes as many as 15 in number, and hatch in 23 days. The Larva, after hatching, remains where it is and spins a close pearl-coloured cocoon over itself, and often over the empty eggshell also. It usually connects its cocoon with that of its neighbour. Here it remains asleep until mid-April, when it eats its way out of the cocoon and through the grass stem and goes off to find for itself a fresh-grown grass blade. This it nibbles at the edge and then spins the edges together until it has formed a tube in which it lives, alone, feeding off the blade above the shelter both by day and night. After the 4th and last moult, it spins a layer of silk along the surface of several blades, making a tent. This partly hides the Pupa, which is fastened to the grass, head up, by the tail-hooks and a silk girdle, and lasts some 14 days.

The Butterfly is one of the swiftest of all our

ADOPOEA ACTEON

Skippers, darting from flower to flower. It prefers rest-harrow, marjoram, and thistle flowers, and its positions are the same as those of the other two species in the genus, basking with fore wings half closed and hind wings flat, and sleeping or resting in dull weather with the wings closed, as do the majority of Butterflies.

GENUS HESPERIA

Fabricius

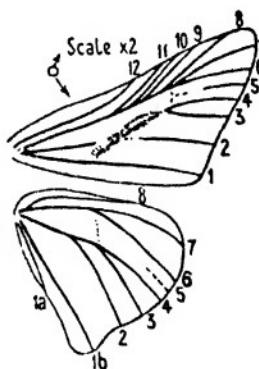
One species, *comma*

Eggs. Shaped as an inverted pudding-bowl.

Larva. Covered with minute spines, narrow retractile neck, and with anal comb and white wax under hinder segments. Lives in a spun tent of leaves.

Pupa. Attached by many hooks to a cocoon.

Butterfly. Differs from *Adopoea* as follows: the antennae end in a short, sharp, slightly curved point; the male sex mark is rather differently placed; and in the hind wing, No. 8 starts nearer to the base. In both wings No. 5 and the cross-bars are very weak.





SILVER-SPOTTED SKIPPER

Hesperia comma

Habitat. All Europe and Asia, also NE. Africa. Here, resident and locally common on the chalk and limestone downs and hills of south England only.

Description. Larva. The small 1st segment is retractile. There is a comb, in which each tooth is of equal length, for the ejection of excreta. The whole is covered with small orange bristles growing from black warts. There is white wax under the 9th-11th segments.

Food-plant. Grasses, chiefly sheep's fescue, also tufted hair-grass.

Pupa. Covered all over with hooks (in tufts on the head) and with a grey waxy bloom. The male shows on the wing a dark mark where the scent-scales will appear on the butterfly.

Butterfly. The antennae have a hook at the end. The sexes differ, the males having the long scent-scale marks on the fore wings, and the females being usually larger and with the yellow markings showing more distinctly. The examples figured show the light and dark forms which may occur in either sex. This variation seems to be climatic, wet years producing more of the darker form.

Varieties. Apart from the above normal variation, some albinos have been recorded, with the darker colour a pale lilac drab and the male scent-scale mark a silvery white.

Identification. The pure white spots on the under side differentiate them from any other Skipper.



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SILVER-SPOTTED SKIPPER

COMMA

SILVER-SPOTTED SKIPPER

Life cycle. One generation a year, hibernating as Eggs.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Eggs-----			Larva-----				Pupa Bfly	Eggs-----			

Life history. The **Eggs** are laid, singly, on the blades of the grass, and hatch in the end of March or April. The **Larva** eats its way out of the egg by a round hole and then, instantly, spins several blades of grass together into a tent. In this it remains hidden, feeding, chiefly by night, on the surrounding grasses, although not necessarily the species on which it was laid. It has a trick of crawling quickly backwards if touched. It is solitary and, after the 4th and last moult, spins a strong cocoon made of silk and bits of bitten-off grass stems and blades in which to pupate. It lasts about 100 days. The **Pupa** is firmly attached to the cocoon by its numerous hooks and lasts about 10 days.

The **Butterfly** flies low and swiftly from place to place, differing from most Skippers in very rarely resting on bushes, leaves, or tall vegetation, but usually choosing short turf, bare ground, sheep's droppings, or low flowers. It rarely rises much above the ground, except if fighting off other species. It basks in the sun with the fore wings partly open and the hind wings open and flat, while it sleeps at night (usually

HESPERIA COMMA

upon a flower-head) with the wings closed as do most Butterflies. It favours thistles (particularly the ground thistle) and knapweed. The life of this species is unusually short, being only 15-16 days.

GENUS OCHLODES

Scudder

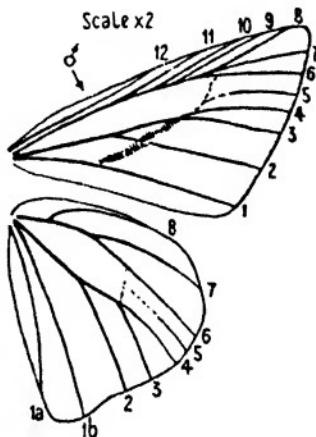
One species, *venata*

Eggs. Hemispherical, smooth.

Larva. Covered with minute spines, with curved anal comb, and white wax under the hinder segments. Lives in a spun tube of grass.

Pupa. Has spines on head and body and is attached thereby to a cocoon in the grass tube. The tongue case is detached from the body.

Butterfly. Differs from *Adopoea* as follows: the antennae end in a definite, sharp, recurved hook.





LARGE SKIPPER

Ochloides venata

Habitat. Europe (except the Arctic) and across Asia to Japan; also N. Africa. Here, resident and common in England and Wales, becoming less common northwards and absent from Northumberland. Present, sparsely, in Scotland up to the Clyde-Forth line. In Ireland, reported from Kerry and Wicklow only.

Haunts. Woods (in rides) and wood-sides, rough ground, hill-sides, downs, and coastal cliffs.

Description. Larva. With white wax under the 9th-11th segments. On the 11th segment, near the

spiracle, is an oval black ring surrounding a space from which a small white horn can be protruded. There is a comb of 18 teeth (longest in the centre) with which the excrement pellets are jerked to a distance of a yard or so.

Food-plant. False brome-grass.

Pupa has the tongue case almost reaching the tail and separate from the body. There are long spines at the head, and tail-hooks.

Butterfly. The antennae have hooks at the ends. The sexes differ. The males have the long scent-scale marks on the fore wings, which are lacking in the females, and the females are usually larger, more clearly marked, and also somewhat brighter on the under side.

Variation in size is greater than in most species, but other differences are slight. The colour is sometimes paler than usual and the markings more or less defined.

Identification. The only species likely to be con-



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LARGE SKIPPER

VENATA

LARGE SKIPPER

fused with this is the Silver-spotted Skipper, *comma*, and the under sides, with no white spots, make a clear distinction.

Life cycle. One generation a year, hibernating as full-fed Larva.

TIME-TABLE:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Larva				Pupa							
				Butterfly -							
				Eggs							
				Larva							

Life history. The Eggs are laid singly, in the open, on the under side of a blade of grass, and hatch in about 18 days. The Larva, on emerging, eats the empty eggshell and then spins the edges of the blade together into a tube long enough to house it, by making some half-dozen ropes, each of many strands of silk, which contract and close up the blade. In this tube it lives, crawling out, by day and night, to feed and lengthening the tube as needed. Like most other caterpillars which live in grass tubes, it keeps its dwelling clean by throwing out its excreta to a distance with the aid of the special comb previously described. It moulted 6 times. Before pupating it spins a cocoon, made of a mass of silk cords, in which the Pupa is found, fastened by the spines on the head and the tail-hooks. It lasts 20 days.

The Butterfly is a swift and powerful flier, though rarely travelling far. It sits upon bushes and tall plants and grasses and, when alighting, has a trick

OCHLODES VENATA

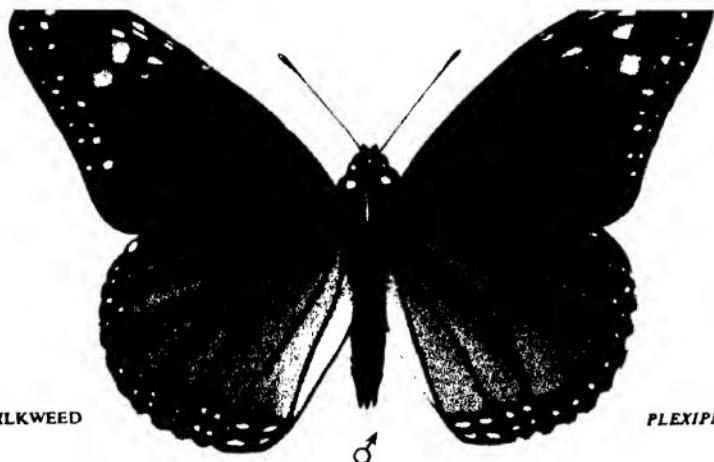
of turning round or walking a little with half-raised wings. In the sun it rests with front wings half open and hind wings flat (see sketch on p. 281), but when asleep or resting in dull weather, closes the wings over the back. It darts off to attack other insects of its own or other species. Life about 20 days.

APPENDIX

The following nine species are in the 'British List'—that is to say they have been found in these islands. For many reasons I have preferred to exclude them from the body of the book and to make this appendix for them. They are not truly British Butterflies. Some once were: others, so far as we know, never have been, but, being residents on the Continent have, rarely, strayed here. My test is: does the appearance of a specimen produce a letter to the papers? If it does—appendix.

In two cases it was doubtful whether to put a species here or in the body of the book. The Pale Clouded Yellow, *hyale*, has in some years been recorded in considerable numbers and its habits are very similar to those of its congener, the Clouded Yellow, *croceus*. Its visits are, however, much rarer and a capture of *hyale* would certainly be reported in a letter to the press, but that of *croceus* would not, unless it were seen in a migrating swarm. It also seemed a pity to extrude the Camberwell Beauty, *antiopa*, so long the most ardently sought prize of the collector. But the same reasons resulted in the same decision.

Of the 'British List' I have left out altogether only one: the Large Copper, *dispar*. It has been completely extinct for some 90 years and must be ranked with the Mastodon or the Sabre-toothed Tiger. Another sub-species has been introduced to replace it (with some success), but of this it is, in my view, too early to speak in a book of British Butterflies.



MILKWEED

PLEXIPPUS



QUEEN OF SPAIN FRITILLARY

LATHONIA



APPENDIX

MILKWEED or MONARCH *Danaus plexippus.*

A stray from America, where it breeds in Central America and the southern U.S. Certainly ship-borne and possibly (?) migrating from the Canaries where it is resident. Usually recorded in September. First in 1876; some 33 between that date and 1928, and 30 specimens in 1933; one in 1934. It migrates yearly from its southern home to Canada and has a regular return migration southwards in the autumn. It cannot breed here, as its only food-plants, the milk-weeds (*Asclepias*), are not found here. These are essential to its existence.

QUEEN OF SPAIN FRITILLARY

Argynnис lathonia.

A rare and occasional immigrant from the Continent where it is common. Most records are from Kent and in August or September: in 1872 over 50 were taken; 14 were recorded between 1884 and 1929, and one at Brighton in 1937. There seems nothing to prevent its breeding here, but it cannot survive our winter, so that it dies off until fresh immigrants arrive.

Identification. Note: (1) shaped like Painted Lady, *cardui*, and (2) with under-side silver spots larger and more numerous than any other species.



CAMBERWELL BEAUTY

ANTIOPA

APPENDIX

CAMBERWELL BEAUTY *Nymphalis antiopa*.

A rare, but not very unusual, immigrant, mainly from Norway. It is found almost all over the northern hemisphere. In 1872 large numbers arrived and spread all over this country, and it is seen almost every year. Since 1924 many have been bred and released, so that recent records do not necessarily mean immigrations. Most records are from the eastern half of England and Scotland, and in August and September. Its life and habits are similar to those of the Large Tortoiseshell, *polychloros*, but it seems unable to endure our damp, though comparatively warm, winter. One or two hibernated individuals have been found, but never Larva or Pupa. The males are somewhat smaller.

APPENDIX

LONG-TAILED BLUE *Cosmolyce boeticus.*

An exceedingly rare immigrant from the Mediterranean basin. Eighteen records since 1859, of which three together in 1926. All between 2nd August and 2nd October. Some have laid eggs on arrival and bred Butterflies, but they cannot survive our winter. In its native home it breeds continuously without hibernating.

Identification. Note: (1) the tails, and (2) the under side with its two silver and black dots and its general look of a 'hairstreak' rather than a 'blue'.

SHORT-TAILED BLUE *Everes argiades.*

The rarest of all casual migrants: only six occurrences during the last 60 years. Common on the Continent and as near to us as Brittany, where it has two generations yearly.

Identification. Note: (1) the short tails, (2) upper sides much like Common Blue, *icarus*, but more lilac, and (3) under sides much as Holly Blue, *argiolus*, but smaller.

MAZARINE BLUE *Cyaniris semiargus.*

Once an established resident in England, extinct here since 1876. One or two have been since taken, doubtless stray migrants or accidentally imported from the Continent where it is widely distributed.

Identification. Note: (1) upper side much as Common Blue, *icarus*, but the female has no markings and an even bronzed brown colour, (2) under sides much as Large Blue, *arion*, but with fewer spots.



LONG-TAILED BLUE

BOETICUS



SHORT-TAILED BLUE

ARGIADES



MAZARINE BLUE

SEMIARGUS

APPENDIX

BLACK-VEINED WHITE *Aporia crataegi*

Once a common resident in S. England but now extinct, having died out between 1870 and 1895. Once reported in 1926. It is still common on the Continent, but liable to local disappearances.

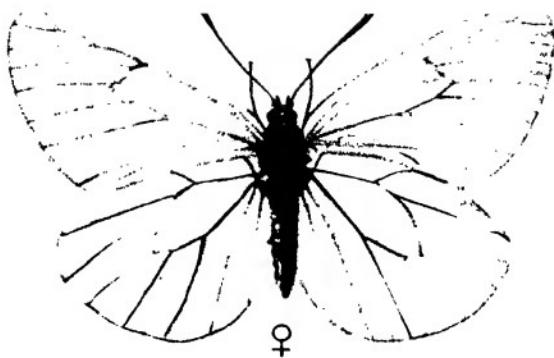
The female, here figured, has the wings very thinly covered with scales—almost transparent in places. The male is similar, but his veins are blacker and the wings less transparent.

BATH WHITE *Pontia daplidice*.

A very rare immigrant from the Continent, where it is common. Recorded in some numbers in 1872, chiefly in the SE. counties of England, and very occasionally since (one in 1937) mainly in July and August (2nd brood). In all about 60 specimens have been recorded. It cannot survive our damp chilly autumns.

The female is similar, but with an extra black spot on the fore wing, and slightly heavier marking on the hind wing.

Identification. Readily confused with the female Orange Tip, *cardamines*. Note that, on the fore wing, *daplidice* has (1) the black discal mark double-broken by the cross-bar, which cuts athwart it, (2) the black at the tip of the wing broken by a row of white spots, and, (3) on the hind wing, there are black scales. Also that on the under side (4) the fore wing is more definitely and heavily marked, and (5) the hind wing is green and white, with faint yellowish nervures, while *cardamines* has more white and less green, and the green is made up of black and a much more brilliant yellow.



BLACK-VEINED WHITE

CRATAEGI



BATH WHITE

DAPLIDICE

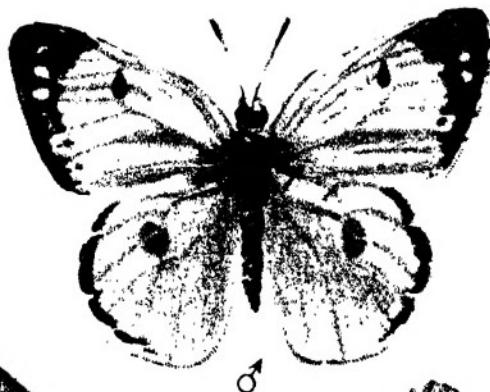
APPENDIX

PALE CLOUDED YELLOW

Colias hyale.

An occasional immigrant from the Mediterranean shores, where it is common. Like its congener, *croceus*, it migrates largely every year and sometimes reaches this country. There are years of comparative abundance, the last being 1901, since which it has only occurred, in small numbers, in two years. When it arrives on our S. coasts it spreads northwards, as does *croceus*, which it resembles in most respects, but it does not extend beyond the Midlands.

Identification. Hard to distinguish from the pale, female form of *croceus*, Ab. ♀ *helice* (compare p. 269). Note that the change in colour of *helice* does not alter the black markings, and that *hyale* has much less black on both wings, particularly that the black on the fore wing does not extend round the lower corner



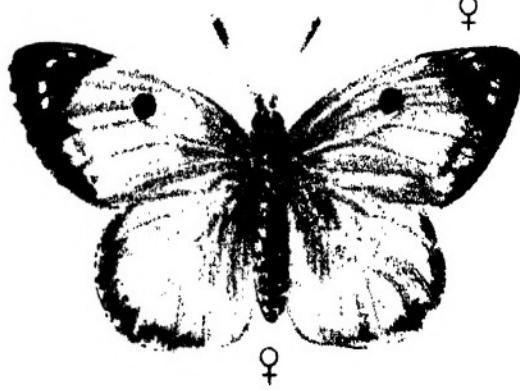
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PALE CLOUDED YELLOW

HYALE

